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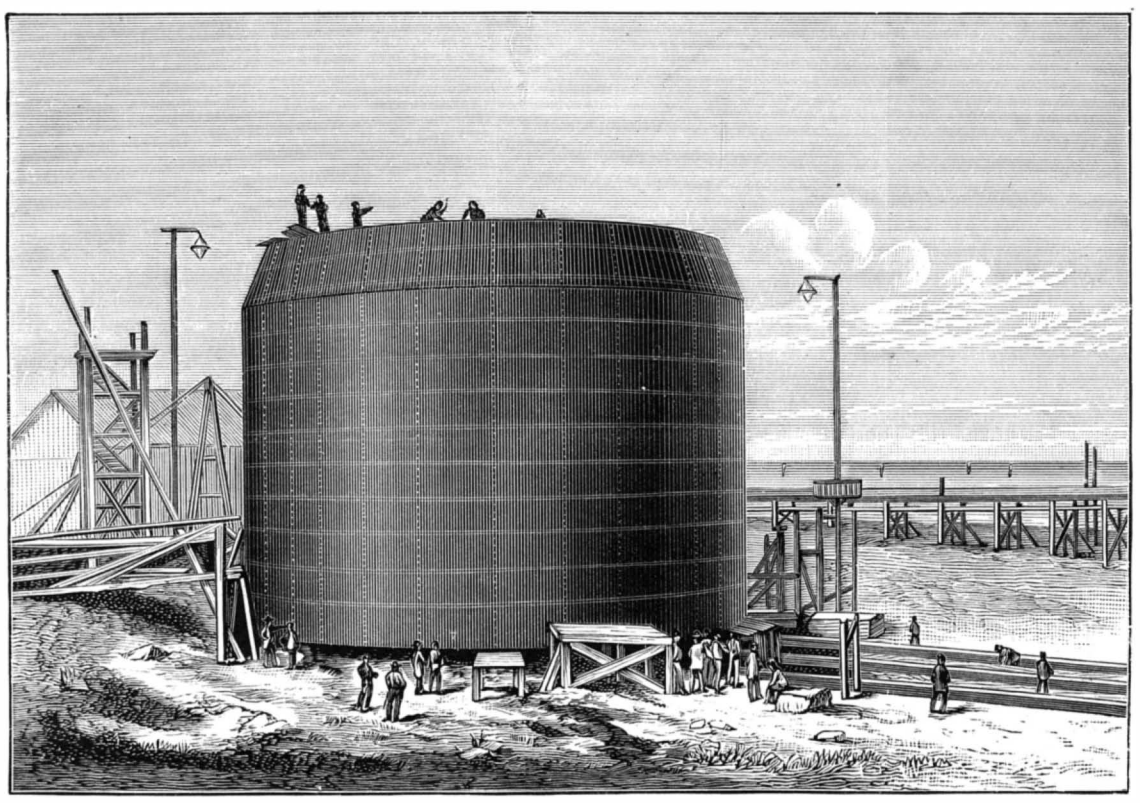
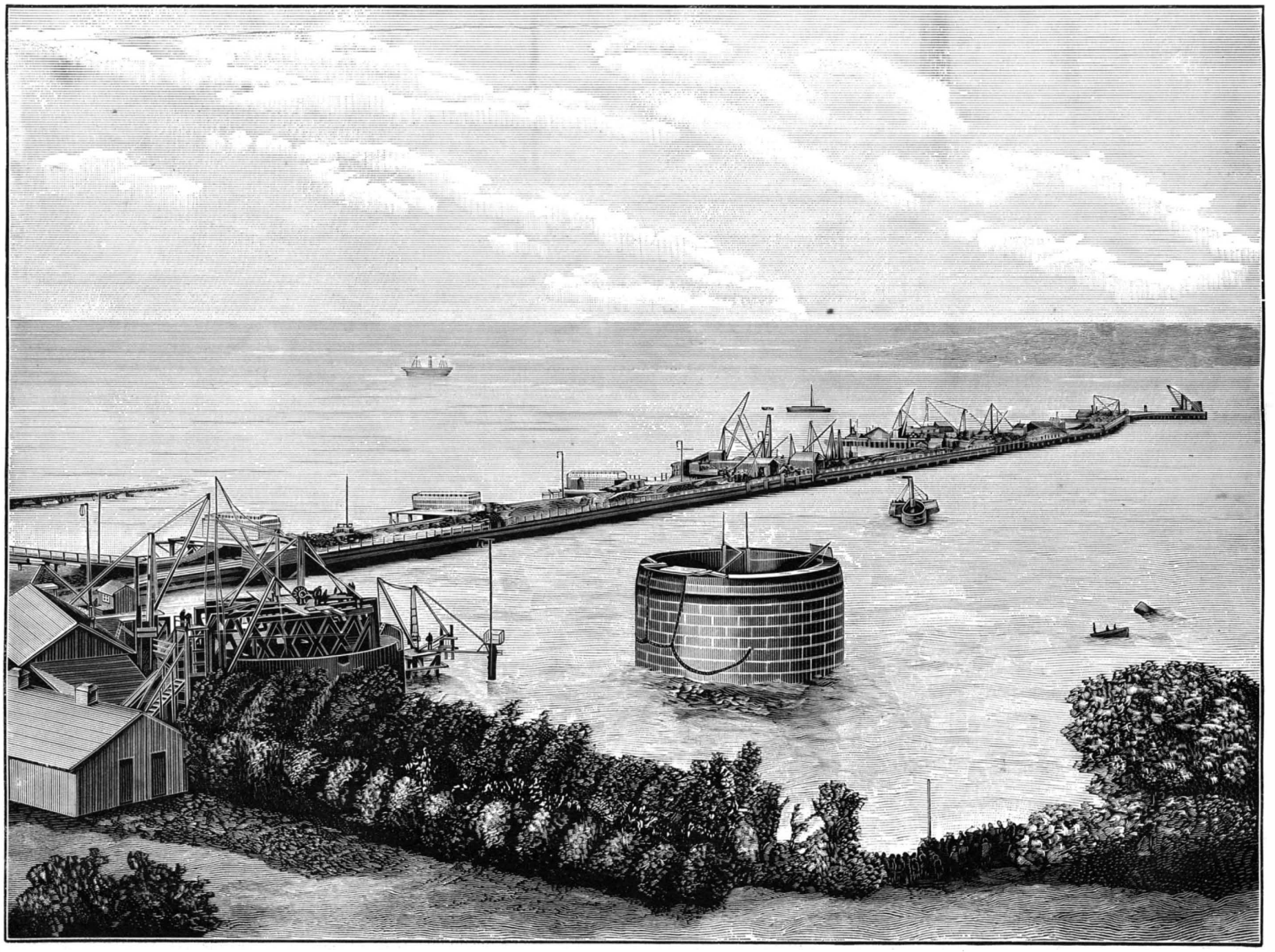
## THE FORTH BRIDGE.

From time to time we have published accounts of the progress of the Forth Bridge, and in the present issue we give illustrations of the caissons for the Queensferry Pier. It will be remembered that there are three main piers known respectively as the Fife Pier, the Inch Garvie Pier, and the Queensferry Pier, and upon each of these there is built a huge cantilever stretching both ways. The Fife Pier stands between high and low water mark, and is separated by a span of 1,700 feet from the Inch Garvie Pier, which is partly founded upon a rocky island in mid-stream. Another span of 1,700 feet carries the bridge to the Queensferry Pier, which is at the edge of the deep channel. The total length of the viaduct is about 1½ miles, and includes two spans of 1,700 feet, two of 675 feet, the shoreward halves of the outer cantilevers, fifteen of 168 feet, and five of 25 feet. Including piers, there is thus almost exactly one mile covered by four main spans, and half a mile of viaduct approach. The clear headway under the center of the bridge is 150 feet above high water, and the highest point of the bridge is 360 feet above the same datum. The contract was let to Messrs. Tancred, Arrol & Co., on December 21, 1882, for 1,600,000*l.*, and work was commenced in the following month.

Each of the main piers comprises four columns carried down to the rock on the bowlder clay. Three of the Fife columns are completed, and the remaining one is in progress; at Inch Garvie one pier is complete, one is in progress; while at Queensferry the work on the caissons is advanced. All the pneumatic caissons will be filled with concrete up to low water mark, of a mixture having



THE FORTH BRIDGE.—THE CAISSON READY FOR LAUNCHING.



THE FORTH BRIDGE.—LAUNCH OF A CAISSON 70 FEET IN DIAMETER.

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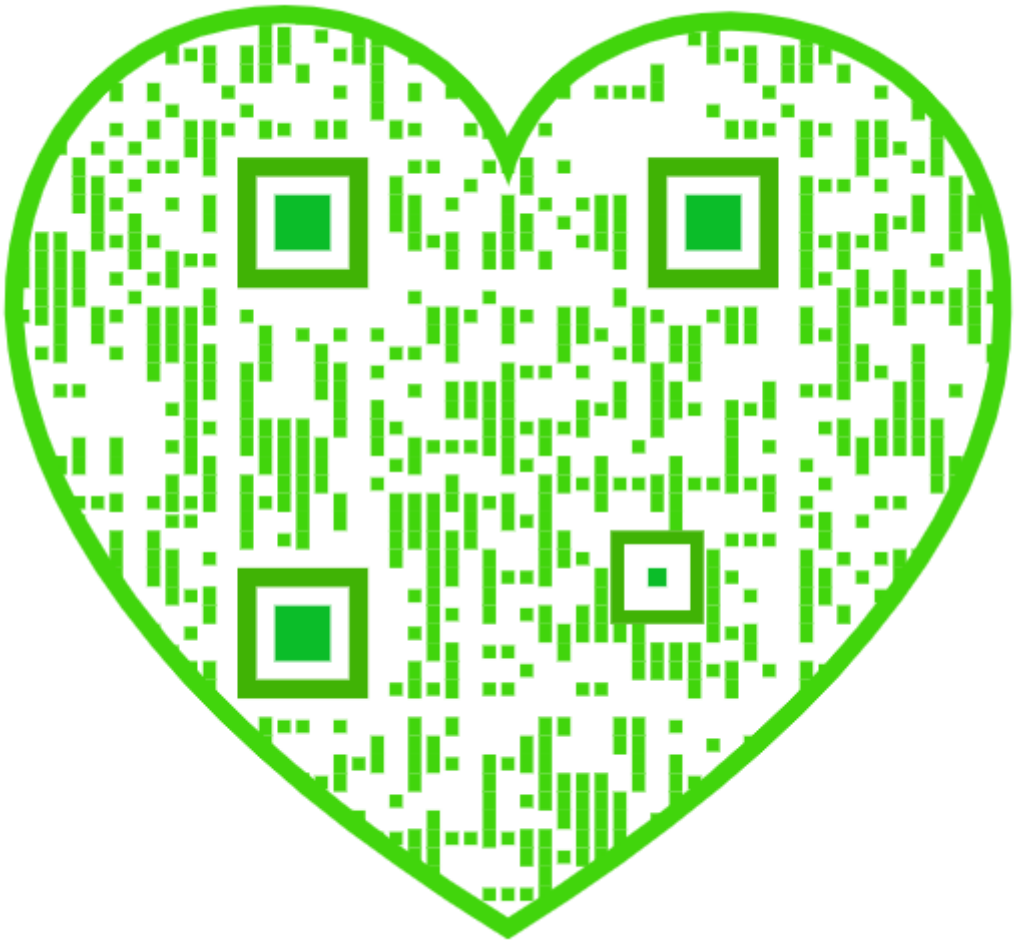

a crushing strength of 50 tons per square foot. Above low water the cylindrical piers, which are 49 feet in diameter at the top, 55 feet at the bottom, and 36 feet high, consist of the strongest masonry, the hearting being flat bedded Arbroath stone, and the facing, Aberdeen granite. In each cylindrical pier there are 48 steel bolts, 1½ inches in diameter and 24 feet long, to hold down the bed plate and superstructure of the main spans. One of the Fife piers was built by aid of a timber and clay cofferdam, and one by means of a half tide dam. At Inch Garvie much of the work of the shallow piers had to be done at low tide under great difficulties.

The Queensferry Pier consists of a group of four cylindrical caissons 70 feet in diameter at the bottom edge. Owing to the special conditions of the site, the work differs in some respects from ordinary pneumatic caissons. The bed of the Forth at the Queensferry Pier is of very soft mud for a depth of from 20 feet to 35 feet, when the bowlder clay is reached, the surface of both the mud and the clay falling sharply toward the 200 feet deep channel between Queensferry and Inch Garvie. The caissons had to be floated out and sunk about one-third of a mile from shore in an exposed seaway. To facilitate operations, the caissons have double skins, 7 feet 6 inches apart, and vertical bulkheads between the skins. By filling the space between the skins with concrete to varying heights, the irregularity in the level of the bottom, and the hardness of the mud, could be to some extent compensated for, as the weight brought upon the cutting edge of the caisson could be regulated as desired. Iron being cheap, a liberal use was made of it in conjunction with concrete where masonry or brickwork might have been employed. Strong lattice girders and cross girders stiffen to the required extent the roof of the working chamber. These girders are subject to a heavy bending stress upward and downward, owing to the tide, the range of which is about 20 feet. Thus if sufficient concrete were filled over the roof to balance the air pressure at mean tide level, then at high water the excess of air pressure, unbalanced by the weight of concrete, would obviously be that due to the half tide difference of height, and at low water, similarly, the excess weight of concrete would be of the same amount. There would thus be a force of more than 1,100 tons tending to bend the girders downward at low water and upward at high water.

Two shafts 3 feet 6 inches in diameter, with air locks for passing out the excavation, and one shaft with double air lock for the men, are provided, together with ejector pipes for the mud, water pipes, supply pipes for the concrete, and other conveniences.

For the above particulars and our engraving we are indebted to *Engineering*. Further descriptions of the great Forth Bridge and additional engravings will be found in SCIENTIFIC AMERICAN SUPPLEMENTS 354, 457, and 478.

### Toughened Filter Paper.

Mr. E. E. H. Francis recently read a paper at the Chemical Society in which he showed that filter paper, ordinarily so weak, can be rendered tough and at the same time pervious to liquids by immersing it in nitric acid of relative density 1·42, then washing it in water. The product is different from parchment paper made with sulphuric acid, and it can be washed and rubbed like a piece of linen. It contracts in size under the treatment, and undergoes a slight decrease in weight, the nitrogen being removed and the ash diminished; whereas a loop formed of a strip 25 millimeters wide of ordinary Swedish filter paper gave way when weighted with 100 to 150 grammes, a similar loop of toughened paper bore a weight of 1·5 kilogrammes. The toughened paper can be used with a vacuum pump in ordinary funnels without extra support, and fits sufficiently close to prevent undue access of air, which is not the case with parchment paper. A good way to prepare filters for use with the pump is to dip only the apex of the paper into nitric acid, then wash it with water. The weak part is thus effectually toughened. Toughened filter paper will be exceedingly useful, not only to chemists, but to other scientists, both practical and theoretical.

### A New Clock.

A very interesting clock has been fixed opposite the National Provincial Bank in Bishopsgate Street, London. It is on the 24 hour principle, and is remarkable as possessing probably the simplest method which has yet been introduced for indicating time upon the new enumeration. The new clock has only one hand, the long minute hand, and the figures around are placed as heretofore; instead, however, of indicating the hours, they indicate the minutes only, which are marked from 5 to 60. The hours are shown on a sunk dial revolving under the upper dial, a space being left in the upper dial in which the next hour figure comes forward instantaneously upon the minute hand completing its circuit of 60 minutes. In short, the solitary hand marks the minutes, and the sunk space shows the hour.


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**Contents.**

(Illustrated articles are marked with an asterisk.)


Agricultural machinery abroad.. 215
Alaska, rudder of*..... 216
Apparatus for testing sealed cans* 210
Bleaching, electrical..... 210
Bridge, Forth*..... 207
Business and personal..... 218
Caisson 70 feet in diameter, launch of*..... 207
Car coupling, Rye's*..... 210
Chemistry as a profession..... 216
Clock, a new..... 208
Cover for cooking utensils*..... 212
Dinner for two cents..... 209
Door opener, improved*..... 210
Elbow joint, new, formation of... 213
Engine, rotary, or steam wheel*.. 211
Exposition, New Orleans, progress of..... 209
Feat of the divining rod..... 211
Filter paper, toughened..... 208
Fuel of large steamers..... 217
Garbage, burn..... 213
Gas burner, safety, Pence's*..... 211
Grain drier and cooler*..... 211
Invention, prize offered for..... 209
Inventions, agricultural..... 218
Inventions, engineering..... 218
Inventions, index of..... 219
Inventions, miscellaneous..... 218
Imitation of electro-physiological apparatus and electric tuning forks by hydrodynamic tuning forks*..... 214
Iron trade, revolution in..... 215
Lock, seal, improved*..... 210
Loom, hand, Eugenie*..... 215
Loom, hand, Penelope*..... 215
Notes and queries..... 219
Paper, filter, toughened..... 208
Pencil marks, fixing..... 213
Petroleum in Russia..... 215
Pneumatic postal tubes, progress of..... 209
Pulley oiler, loose, automatic*.... 212
Pumps, Am., for the Soudan..... 217
Rudder of the Alaska*..... 216
Shafts, sinking by freezing*..... 212
Steam wheel, or rotary engine*.. 211
Steel, making, cheaply..... 215
Steel taking the place of wrought iron..... 217
Surgical experimenting..... 216
Teeth, replacing..... 215
Telescopes, concerning..... 208
Tools, sharpening of..... 217
Trees, large, preparation of for moving..... 209
Victoria regia*..... 217


TABLE OF CONTENTS OF

**THE SCIENTIFIC AMERICAN SUPPLEMENT.**

**No. 488,**

**For the Week Ending April 4, 1885.**

Price 10 cents. For sale by all newsdealers.


PAGE

I. CHEMISTRY AND METALLURGY.—The Determination of Graphite in Minerals.—By J. B. MACKINTOSH..... 7704
Sulphocyanide of Potassium..... 7704
Sugar Nitro-glycerine..... 7705
On Remelting of Cast Iron..... 7707
The Hardness of Metals..... 7718

II. ENGINEERING, ETC.—The Jet Ventilator.—4 figures..... 7706
Feeding Boilers at the Bottom.—2 figures..... 7707
The Honigmann Fireless Engine.—The fireless working of steam engines by means of a solution of hydrate of soda.—With several figures and diagrams..... 7708
Simple Methods of Calculating Stress in Girders.—By CH. LEAN.—With full page of illustrations..... 7711
A Spring Motor..... 7711
Steam Yacht..... 7711

III. TECHNOLOGY.—Foucault's Apparatus for Manufacturing Illuminating Gas and Hydrogen.—2 figures..... 7705
The Circle Divider..... 7706
Soluble Glass.—Process of manufacture.—Use..... 7706
Iron Printing and Microscopic Photography.—Formulas for printing solutions.—Compound negatives..... 7707
Practical Directions for Making Lantern Transparencies.—By T. N. ARMSTRONG..... 7707
Casting Chilled Car Wheels.—6 figures..... 7712

IV. ELECTRICITY, ETC.—Electricity and Prestidigitation.—2 figures 7712
Portable Electric Safety Lamp.—6 figures..... 7712
The Electric Discharge and Spark Photographed Directly without an Objective.—6 engravings..... 7716

V. PHYSICS, ETC.—The True Constant of Gravity..... 7714
Origin of Thunder Storms..... 7714
Physics without Apparatus.—Manufacture of illuminating gas.—Elasticity of bodies.—2 figures..... 7716
Scientific Amusements.—Dance of electrified puppets.—Silhouette portraits.—2 figures..... 7716
A Sunshine Recorder.—2 figures..... 7717

VI. MEDICINE, HYGIENE, ETC.—How Cholera is Spread..... 7703
Sulphurous Acid and Sulphide of Carbon as Disinfecting Agents.—Methods of burning the same..... 7704

VII. MISCELLANEOUS.—Improvised Toys.—With numerous illustrations..... 7715
The Æolian Harp.—Kircher's harp, made in 1558.—Frost and Kastner's harp.—Manner of making the harps.—4 figures..... 7716
How to Break a Cord with the Hands.—1 figure..... 7717
An Aquatic Velocipede for Duck Hunting.—2 engravings..... 7717
Skeleton of a Bear Found in a Cave in Styria, Austria..... 7718

VIII. BIOGRAPHY.—Theodor Billroth, Prof. of Surgery at Vienna.—With portrait..... 7703


### CONCERNING TELESCOPES.

A correspondent in Omaha, Nebraska, asks for information on three points: 1. What would be the cost of the largest telescope with unlimited means?

There are two kinds of telescopes, differing radically in construction, each possessing advantages peculiarly its own. One is known as the refracting telescope, because it depends on the refraction of light through glass lenses. The other is called the reflecting telescope, because it acts by reflecting the light from a concave mirror. Refractors are almost exclusively used in the United States, for they are easily managed, convenient, and have proved themselves to be the best working instruments, while the greater part of the astronomical observations of the present century have been made with them. We therefore infer that our correspondent refers to this kind of telescope. We have no means of estimating the cost of the largest telescope that can be constructed with unlimited means, but we can give the cost of some of the great telescopes now in use.

The telescope of the Naval Observatory in Washington, mounted and ready for use in 1873, cost $50,000. It has an aperture of 26 inches, and was, until 1881, the largest refracting telescope in the world. The great Russian telescope at Pulkowa, a refractor of 30 inches aperture, finished in 1882, now enjoys the distinction of being the greatest refractor in the world. Messrs. Alvan Clark & Sons, of Cambridgeport, made the object glass for this huge instrument, at a cost of about $12,000, the mounting being the work of Messrs. Repsold & Sons, Hamburg, Germany.

The Russian telescope will not long enjoy the supremacy. The Messrs. Clark are now in process of making a refractor for the Lick Observatory on Mt. Hamilton, California, with an aperture of 36 inches, which will, when finished, take the first rank in size and probably in cost.

The reflecting telescope of the Earl of Rosse, in Parsonstown, Ireland, takes the lead in size among reflectors. It cost $250,000. The speculum, or mirror, is 6 feet in diameter, weighing 4 tons, and the focal length is about 54 feet.

M. Flammarion, a French astronomer of renown, was firm in the faith that the moon was inhabited. He determined to prove his position by the construction of a monster telescope with such magnifying power as to reveal the men in the moon to terrestrial observers. He planned an immense refractor, far larger than any in existence, which was to cost $200,000. He earnestly solicited contributions from the whole civilized world to help in his project. For some reason, the plan fell through, and we have heard nothing of it since 1879.

The second question (2) is, How much larger could one probably be made than has ever been made, or now being made to your knowledge?

In the case of refractors, it is almost certain that there is no advantage to be gained by increasing the diameter of the object glass or aperture beyond a limit somewhere between 30 and 36 inches. As the aperture and magnifying power increase, the defects in the instrument become more apparent. The first difficulty telescope makers had to contend with was chromatic aberration. This was obviated by the use of two lenses instead of one, a concave lens of flint glass and a convex lens of crown glass, so arranged that their aberrations destroy each other. Telescopes are now made in this way, and are called achromatic telescopes.

A second difficulty now arose, known as the secondary spectrum. It is due to the fact that flint glass as compared with crown disperses the blue end of the spectrum more than the red, and the result is that the refracting telescope is not perfectly achromatic. The defect is scarcely noticeable in a small telescope, but becomes a serious obstacle in a great telescope, increasing with the diameter of the aperture. Since the trouble is inherent in the glass, there seems to be no possible method of overcoming it.

In the case of reflectors, the trouble lies in keeping the great mirrors in perfect figure in every position, the mirror being liable to bend on account of its own weight and elasticity. Such was the case with the reflector at the Paris Observatory. It has a mirror of silvered glass, the diameter being nearly four feet. It was mounted in 1874, but the glass bent under its own weight, and was rendered useless.

The greatest foe to the mammoth telescopes is, however, the atmosphere. The waving and trembling, the moisture, and the currents so pervade the atmosphere at the sea level, that the most powerful telescopes can be used to advantage during but a small portion of the nights of the year. The remedy or amelioration of this trouble is to establish observatories in elevated positions where the air is dry, clear, and steady. These conditions prevail on the mountains and elevated lands of the western and southwestern portions of North America. When, therefore, the largest refractor in the world is mounted and ready for use in the Lick Observatory, under the serene sky that arches above Mount Hamilton, 4,000 feet above the level of the sea, it is reasonable to hope that important tidings from the star depths will be the result.

The third question (3) is, Would the largest and most powerful one that could be constructed create general

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interest to the scholars and to the country generally, and, in your opinion, would such a one add materially to our store of information and give us a better knowledge of the heavens?

The largest telescope that could be made cannot fail to awaken a deep interest among scholars and in the whole country, if, through its great eye, some important discovery were made; for the wonders astronomy reveals touch a sympathetic chord in the popular heart. But the largest telescopes are not as available to the ordinary observer as those of more moderate dimensions, They are valuable not so much for their magnifying power as for their light-gathering power.

We have seen Jupiter and Saturn through the great Russian telescope of 30 inches aperture and through a telescope of 8¼ inches aperature. The difference in the two views was not so much in the size as in the brighter light thrown upon the objects in the larger telescope. The great telescope is used principally to bring out objects that are invisible in smaller ones. Thus the Washington telescope won renown by its discovery of the moons of Mars. Herschel discovered Uranus with his reflector of 2 feet aperture. Mr. Lassell discovered two moons of Uranus with his reflector of 2 feet aperture. Lord Rosse's reflector is used chiefly for making drawings of nebulæ and lunar scenery. The reflector of the late Professor Henry Draper was used in photographing the Great Nebula of Orion, bringing out stars of the 14th magnitude. But it takes practiced eyes and the devotion of a lifetime to detect these minute and distant objects. The directors of the great observatories are absorbed in their work. They have little time or inclination to reveal celestial wonders to ordinary observers, who are untrained to see what they see or to comprehend the abstruse calculations by which they reach results.

Astronomy is making its way to the heart of the people. A widespread interest is felt in all that pertains to the heavens. It is, however, popular astronomy that is demanded. The accounts of eclipses, comets, occultations, are eagerly read, and the movements of the bright planets are followed by thousands of observers all over the country.

It would be a noble work for a philanthropist to endow an observatory, furnish it with the best kind of instruments and efficient officers, and devote it under certain restrictions to the use of the people. The telescope is the only instrument that brings nearer to our eyes the mysterious creations of the firmament, and reveals the vastness of the material universe. Those who are familiar with its revelations must necessarily gain a better knowledge of the heavens, and by their influence increase the general interest in the ennobling science by relating what their own eyes have seen.

## PROGRESS OF PNEUMATIC POSTAL TUBES.

In Paris the new extension of the pneumatic postal system is now complete and in operation, ramifying under the streets in every direction. The places for depositing letters are in the various telegraph offices. By payment of fifteen cents, letters may be instantly sent by tube to any part of the city. The tubes also extend from the post offices to the chief railway stations, and letters posted at the last moment may be sent so as to catch the train. Letters from out of town may, if so paid, be sent by postal tube to destination instantly on arrival of the train in the city depot. These pneumatic tubes are a wonderful convenience to the public, and in time will no doubt become an adjunct of the postal service of all large cities. Their use in European cities is already extensive, much more so than in this country, although Americans sometimes pride themselves upon their enterprise and love of doing things quickly. For delivery of local messages our New York telegraphs and telephones are slow coaches compared with the pneumatic postal tubes. The telephone service in this city is poor compared with what it should be.

It takes a good while to halloo to a correspondent, and when he answers it is not more than about half the time one can hear what is said, so mixed up and noisy are the wires, and so bad the connections. As for telegraphing, one can generally send a messenger boy anywhere within a distance of three or four miles and receive reply quicker than to employ the telegraph. In this city the Western Union Telegraph Co. have a line of pneumatic tubes, extending from Broad St. up Broadway to 23d St., a distance of nearly three miles. This is found by the company to be a quicker and cheaper way of sending its own messages than to use its local wires. We wish the post office department could arrange for the connection of these tubes with our city post office. This could easily be done, as the tubes now pass right in front of the building. The department should also extend the line of tubes from 23d St. to the Grand Central Depot at 42d St., and then we might have a continuous line of about five miles, and enjoy to that extent the privilege of Parisians.

The piers from whence nearly all the principal lines of steamships take their departure from New York are within a distance of a mile or a mile and a half from our city post office, or ten to twenty minutes' smart walk by a letter carrier. But so great is this obstacle to our postal officials, that they are obliged to close the foreign mails from two to three hours before the ships leave the docks. To accommodate merchants and late people, they have what is termed a supplementary mail, which is kept open one hour later. For the privilege of dropping letters in this "supplementary" mail, double postage is required to be paid; and in this manner one may get a letter into the foreign mail sometimes up to within one hour prior to the sailing of the ship, but most generally two hours, as the vessels ordinarily do not leave until two hours after the supplementary mail closes. In view of this mode of conducting things, which is the best our postal people think they can do, it is probably too much to ask or expect of them to lay tubes to the docks, or even to employ a one-armed soldier carrier to start a few minutes before the ship goes, and walk to the vessel with a last bag, and thereby give the public the facility of mailing letters up to the last moment.

## Preparation of Large Trees for Moving.

The span of human life in the present era of the world's existence, even in the case of those who live to be old, is of short duration compared with that of trees, the progress of which to a state of maturity is proportionately so much slower than that of man, that those who plant small trees do not live long enough to see much of the effect they produce. In the case of that favorite fruit the pear, it used to be said that those who plant them plant for their heirs, and with the ordinary kind of trees planted to give effect or shelter there is still longer to wait. To shorten time in waiting is the manifest object of those who go to the trouble of planting large trees instead of little ones in the grounds about their dwellings or other conspicuous places, where the presence of such are required. Where work of this kind has to be done, it often happens that enough forethought is not brought to bear on the proceedings. In place of taking the precaution to previously prepare the trees by trenching round them, and severing the roots to within a movable compass, so as to admit of a season's growth before they are taken up, they are at once transferred from where they have been growing for perhaps a score of years or more with their roots unchecked in any way; the result of which is, that the progress made for a year or two afterward is not near so much as it would be if the roots had been previously shortened back in the way named. The omission of this timely preparation of trees that are to be transplanted when much above the ordinary planting size is the less excusable when it is remembered how little labor cutting in the roots as described involves. To the too frequent absence of judgment and reasonable care in moving trees that have attained considerable size is attributable the failures that occur, and that have led many to the conclusion that it is better to plant small trees and wait for them to grow up, even in positions where it is desirable to have such as would give effect at once. In the case of deciduous kinds of a size such as under notice, and that are intended for removal next autumn or winter, the sooner the root shortening preparation is now completed the better, before there is any appreciable movement in the buds. With evergreens it is better to defer this work until the time that the drying March winds are over, especially in cases where the trees are large and in vigorous condition, as with such the root severance necessary is proportionately more felt than with smaller examples.—*T. Baines, in the Gardeners' Chronicle.*

## Progress of the New Orleans Exposition.

Following a custom inaugurated by the managers of the Philadelphia World's Fair, in 1876, the conductors of the New Orleans Exposition have been having a series of State days, on which the exhibits of previously designated States are especially decked out in their most attractive garb, and commemorative exercises are held in honor of the part taken by each in the Exposition. It is perhaps partly owing to the increased attractions thus presented, as well as to the fine weather and the daily concerts and fireworks exhibitions, that the attendance has been largely increased within the past two or three weeks.

The Mexican exhibit at the Fair has at last received its finishing touches, in the completion of a separate building of gorgeous architecture for the display of its minerals, in one part of which is a hillock of block silver worth $144,000. The Mexican display is in every way most excellent, and affords a far more complete representation of the natural resources of the republic, and the life and history of her people, than was ever before offered to the public. In celebrating the entire completion of the Mexican department, however, the announcement was made that the "Mexican day" proper would not come till May 5, the anniversary of the victory of Mexico over the forces of Maximilian, when the latter endeavored to capture the fortress of Guadalupe, near Pueblo; on this date the representatives of Mexico at New Orleans will put forth all their energies to make a display which shall be particularly impressive.

On "Minnesota day," when the ceremonies were somewhat elaborate, tin drums filled with sorghum sugar made in that State were passed around as souvenirs of the occasion, and one of the speakers referred to Minnesota's exhibit in this line as demonstrating that "the sugar line can be removed eighteen degrees of latitude northward." The principal Minnesota exhibit at the Fair is from one of the great Minneapolis flour establishments, where 7,500 barrels are made per day, the flour being held in pyramids of satin sacks. The total production of flour in Minnesota for 1884 was given as 8,800,000 barrels.

The operation of the fiber decorticator which is being exhibited at the Fair is watched with a good deal of interest, as an entirely successful machine of this nature has long been sought in vain. In an experimental way this machine has been used to clean the fiber of hennequin leaves, plantain and banana stalks, and Kentucky hemp, all of which have been divested of their woody parts in a single operation. It is claimed that this machine is a universal decorticator.

In accordance with the action of a National Convention of Passenger Agents, the railroad rates of fares were recently reduced to a standard rate of one cent a mile on most of the roads taking passengers to New Orleans, and this action is materially contributing, with other causes, to increase the number of visitors now daily visiting the Exposition.

## A Dinner for Two Cents.

There is an organization in London for furnishing poor children with a dinner for a penny (two cents); and from a recent published report it seems to have proved a successful experiment, in a pecuniary as well as beneficent sense; so much so, in fact, that another society has undertaken to furnish dinners to poor children in the poorest and most populous part of London for half a penny. It is said that the children who take their meals at the penny establishment show a marked improvement in health, are more regular in attendance at school, and accomplish better work in their studies than when they commenced their new regimen. It may interest philanthropists who are engaged in ameliorating the condition of the poor in our large cities, to know the materials of which these dinners are composed. The bulk of the ingredients is, of course, vegetables and bread, potatoes and peas holding a prominent place. Both meat and milk are used in moderate quantity.

From the report just made it is calculated that each child receives about twelve or fifteen ounces of soup or other kind of nutriment each meal, and this quantity contains from one to one and a half ounces of meat. The children enjoy their dinners, and appreciate the kind attention they receive at their meals. When one considers how scanty and unpalatable is the food furnished to many poor children at their homes in the great cities, like London and New York, it is not surprising that the poor neglected children thrive better, learn more at school, and are happier for a hot palatable dinner and a kind word from the attendants.

The last experiment of furnishing a halfpenny dinner for the very poorest children from the most squalid parts of London has not been established long enough to determine if the receipts will meet the expenses, but it promises well, and the supporters of the enterprise are confident that it will nearly pay its way.

As many as 303 children were fed on the first day; the number has to average about 566. A choice within a certain limit is given, and care is taken to make the food agreeable and wholesome. The first course consists of a rich stew or bacon sandwiches, the second of bread and jam or bread and cheese. That the children find the dinner ample to satisfy their hunger is shown by the fact of their continued attendance and the little waste made. It is demonstrated that, with the cook's wages, cost of gas and implements excepted, there is no loss, and that they can be made self-supporting.

The penny and halfpenny dinner associations of London suggest a plan which it seems might be advantageously adopted in our large cities, and, if conducted on the economic scale of the London societies, not only poor children, but unfortunate adults, might be relieved of much suffering without imposing any tax upon our benevolent citizens.

Any one wishing to know more of the penny dinner enterprise may obtain copies of a pamphlet on the subject from Messrs. Alexander and Shepheard, 21 Castle Street, Holborn, London. It is sold for one penny.

## Prize Offered for an Invention.

At the third international conference of the societies of the Red Cross, held in September at Geneva, the Empress of Germany offered 5,000 f. and a gold medal as a prize for the best model of a soldiers' barrack and field hospital. The delegates to the conference from this country have issued a request to American inventors to take part in the contest. The barrack must be large enough to contain 12 beds. It must be easy of transportation and made with interchangeable parts, and capable of being taken down and reconstructed. The designs are to be sent to Antwerp, Belgium, by September 1, 1885, when a committee will decide on their respective merits.

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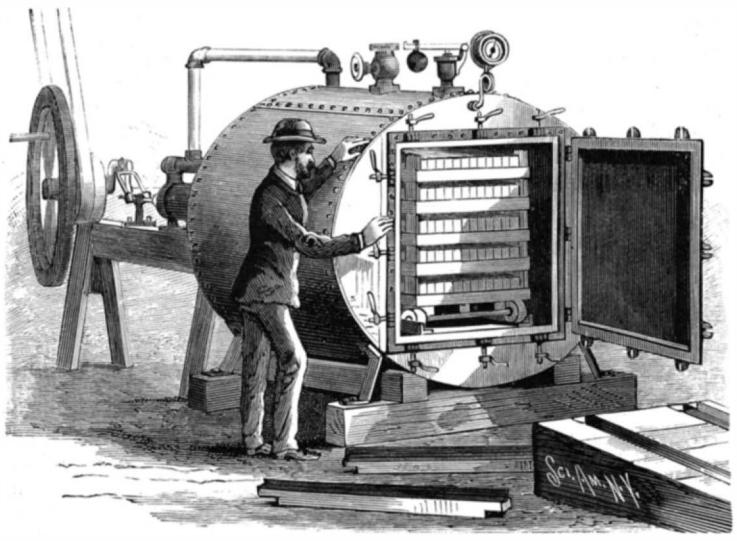
### APPARATUS FOR TESTING SEALED CANS.

The object of this invention, recently patented by Mr. Marvin C. Hutchings, of Astoria, Oregon, is to test sealed cans for the purpose of detecting leaky ones in time to seal them and prevent the contents from becoming decomposed. A cylindrical iron or steel vessel, placed horizontally, is provided at one end with a hinged door which may be held closed hermetically. The cans to be tested are placed on a truck running on a track laid within the vessel. The cylinder is furnished with a pressure gauge and safety valve, and is connected with a pump for filling the vessel with air under pressure. After remaining in the vessel for several minutes, the compressed air is allowed to escape suddenly. The air has time to find its way into all cans which are not soldered perfectly tight, so that an equilibrium of pressure is maintained outside and inside; but upon the sudden relief of exterior pressure,

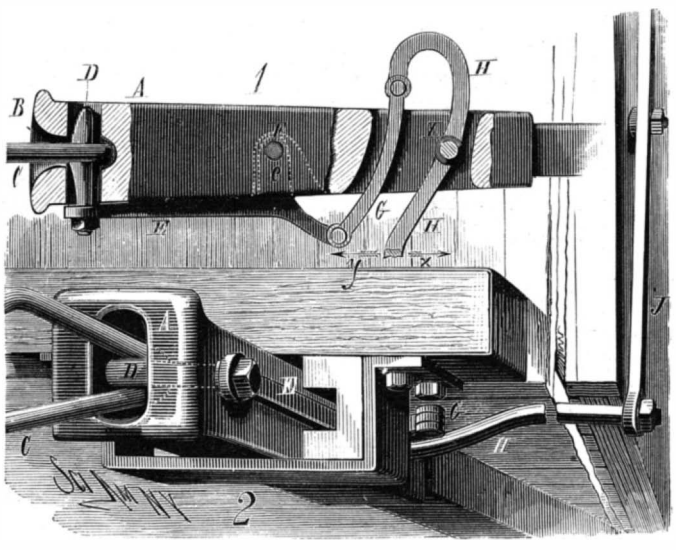


HUTCHINGS' APPARATUS FOR TESTING SEALED CANS.

the air within the defective cans fails to find ready exit, owing to the small size of the openings in them, and hence exerts a strong outward pressure, thereby bulging one or both heads. The bulged cans can easily be assorted from the rest, and are then soldered and again tested; by this means great losses in material and freight are avoided.

### CAR COUPLING.

By means of the coupling shown in the engraving the cars may be coupled without requiring the trainmen to stand between them. The drawhead, A, has a socket, B, which ranges vertically so as to receive the link, C, which stands edgewise instead of lying horizontally in the common way. The link is formed tapering, both ways from the center toward its ends, and the link sockets are correspondingly shaped. Near the base of the link socket is a horizontally ranging hole to receive the coupling pin, D, which is connected with the outer end of the lever, E, which is formed with a lug, *c*, entering a recess in the side of the drawhead; the lever is pivoted so as to swing in a horizontal plane by the pin, F. One end of the lever, H, is curved, and is connected by the link, G, with the short arm of the lever, E. The other arm of the lever, H, extends to the side of the car, where it connects with the lever, J, fulcrumed to



RYE'S CAR COUPLING.

the car body and leading to the roof, where it passes between two bars having a series of holes, in any one of which a spring pin on the lever may be passed; this locks the levers in any desired position, so that the coupling pin, D, cannot be displaced accidentally. To uncouple the cars, it is only necessary to unlock the pin from the bars and swing the lever, J, in a direction to withdraw the coupling pin. The forward edge of the coupling pin is curved, as shown in the plan view, Fig. 1, in order that it may be easily withdrawn by the levers should there be any tightness of the link on it. The levers may be locked so as to hold the pin with-drawn, so that when necessary the cars may come together without coupling. When the coupling is fitted to passenger cars, the frame of the locking device is fixed to the platform; and when applied to flat box or coal cars the lever, H, is extended to form a handle from which the mechanism can be operated; in this case the lever is provided with a suitable locking device. The coupling link, having narrow ends, will readily enter the link socket of an opposing draw head, be it higher or lower; the link need not be held and guided, as it enters the head automatically.

This invention has been patented by Mr. Edgar Rye, of Albany, Tex.

### Electrical Bleaching.

M. Bonneville (in the *Teinturier Pratique*) gives the following recipe: Into a cold solution (containing 1 per cent of bromine) there is poured 1 per cent of caustic soda at 36° B., or the equivalent of another alkaline base; then the vegetable textile (previously wetted and perfectly saturated with water) is introduced, and is left in the bath until discoloration takes place. After a passage through acidulated water, drying and rinsing takes place. One per cent of sulphuric acid or of nitric acid, poured into the bath when the latter is exhausted by successive discolorations, suffices to place the bromine once more at liberty. By then adding the same proportion of caustic soda, the hypobromite of soda is regenerated. The hydrofluosilicic acid, in composing the bromide and the bromates, forms an insoluble salt of fluosilicate of sodium, which it is easy to eliminate by decantation. In this case there are neither sulphates nor nitrates mixed with the water containing bromine. In the last place, if during the bleaching there are placed in the bath the two electrodes in carbon of one pile, the decoloring oxygen is constantly renewed by the reformation of hypobromous acid. It has also been found that a bath entirely exhausted—that is, only still containing bromides and alkaline bromates—is regenerated by the passage of the current. The same phenomenon is produced with chlorine and its oxygenated compounds. In fact, therefore, M. Bonneville recommends the industrial employment of bromine and hyprobromites in the bleaching of vegetable textiles, the regeneration of the baths by acids, and more specially by hydrofluosilicic acid; and the reconstitution of the decoloring power of bleaching agents by means of electricity.—*The Dyer*.

### IMPROVED SEAL LOCK.

The engraving herewith shows a seal padlock in which the casing is formed into ways for receiving a seal, which is retained in place by the shackle when it is snapped into engagement with a sliding bolt within the casing. The U-shaped shackle is hinged at one end to the casing provided in its outer surface with a longitudinal slot, *b*, through which the tag, *c*, can be seen; the tag is slipped in a recess through a slot in the free end of the casing. Held in the recess by a screw is a sliding bolt, *a*, the under side of which is formed with serrations, and on its upper side is a spring, which forces it forward to engage with a slot in the end of the shackle to lock the latter. The bolt and spring may be withdrawn from the casing by removing the screw. The spring is held in place by the bolt, no other means of securing it being required. The shackle is held to the car by a chain, as shown in the cut.

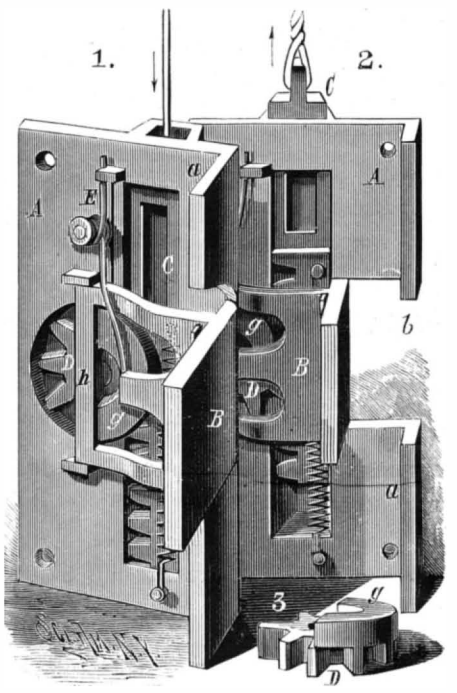
The tag or ticket showing the destination of the car is slipped into the recess. The door is shut, and the shackle passed through one of the staples, when the lock is closed by passing the end of the shackle through the end opening in the casing. Before the door can be opened, the shackle must be released from the casing, and this can only be done by withdrawing the sliding bolt. The bolt can only be withdrawn by piercing the tag with a suitable implement, the point of which will engage with the serrations on the bolt, which may be thus pushed back. This operation destroys the tag, and clearly shows that the lock has been opened. An aperture is formed in the end of the shackle for receiving the usual seal.

Additional particulars regarding this seal lock can be had by addressing the inventor, Mr David B. Reeve, Pier 39 East River, New York city.

DR. V. POULAIN writes to the *British Medical Journal* that he has always found a tablespoonful of fine bran in bread and milk, night and morning, to be the best method of combating constipation in children, and it is very useful in conveying to the child silica and phosphates. The bran may be allowed to soak in the milk, and then, when warmed up to a little below boiling point, it should be poured on the bread.

### IMPROVED DOOR OPENER.

An invention lately patented by Mr. Edward G. Worley, of 2056 Lexington avenue, New York city, relates to door openers used in apartment buildings, for opening the front door from the different stories of the building. The main plate, A, of the holder is flanged at *a*, is cut away to receive the sliding keeper, B, and is recessed to receive the pull bar, *c*; it is also formed with a circular cavity and stud to receive the pinion, D, which is revolved by the pull bar for withdrawing the keeper, the rack teeth of the bar meshing with the cogs of the pinion. The pinion is formed with a segmental flange,



WORLEY'S IMPROVED DOOR OPENER.

*g* (Fig. 3), and the keeper is formed with a cross piece, *h*, which is constantly held against the flange by the action of the spring, E, serving to force the keeper to its most outward position. When the pull bar is drawn outward for opening the door, the revolution of the pinion causes the flange to act as a cam against the cross piece, *h*, to withdraw the keeper to the position shown in Fig. 2. The pull bar is normally held drawn downward to the bottom of the recess by a coiled spring, the reaction of which will replace the part of the opener (to the position shown in Fig. 1) after the strain upon the wire connecting the pull bar with the knob in the building above ceases. A one-quarter revolution of the pinion will wholly withdraw the keeper, and since the flange, *g*, is curved, any further movement of the pinion will not change the position of the keeper, so that the distance the bar may be drawn beyond the point at which it gives the pinion a one-quarter revolution will be independent of the keeper, and will be against the constantly increasing tension of

REEVE'S IMPROVED SEAL LOCK.

the spring. This furnishes a yielding pull for the opener, which is very effective in preventing overstraining and breaking of the wire. The keeper is guided by studs at the back of the main plate, and its outward movement is limited by side projections striking against the flange, *a*.

RATS have a great aversion to the odor of the chloride of lime, and, when mixed with water and poured into the holes through which the rats pass, they usually vacate their haunts. This mixture is harmless, does not kill the rats, but drives them away—sometimes.

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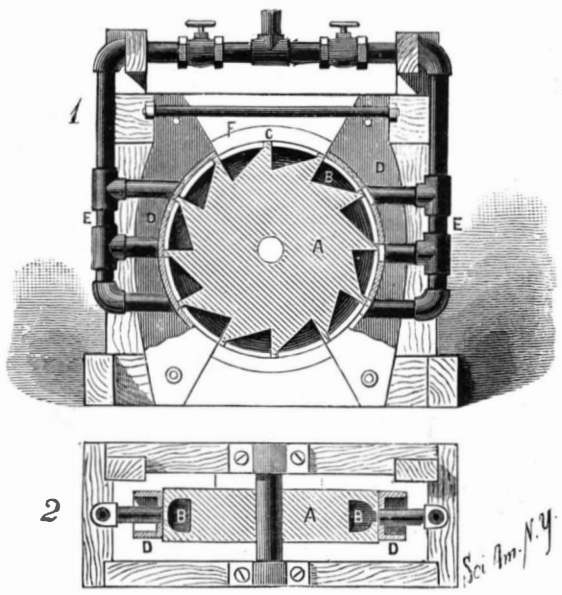
### A STEAM WHEEL, OR ROTARY ENGINE.

The illustration herewith clearly indicates the principal details of construction and arrangement of parts in a rotary engine, or steam wheel, which has been patented by Mr. Robert Powers, of Charleston, Miss. In our engraving, Fig. 1 shows a transverse sectional elevation, and Fig. 2 a horizontal section. A represents a cast metal disk of any approved size, with cavities or pockets, B, in the face, separated from each other by narrow bridges, C, there being narrow slit openings through the face of the disk to the cavities




POWERS' STEAM WHEEL.

or pockets. One or more covers, D, are fitted steam-tight to the face of the disk, having passages through which steam is admitted to the cavities from the boiler by the pipes, E, while F represents exhaust spaces, between the covers, D, on opposite sides of the wheel, for the escape of the steam after it has done its work. These exhaust spaces are arranged at such distance from the last inlet passage that the exhaust will not open until the steam pocket has passed entirely beyond the inlet, and the inlet is cut off from the exhaust by the bridge between it and the next cavity. The covers, D, are strongly bolted to the bed-frame, and are connected by rods having nuts, to draw them tight up against the face of the disk, from time to time, these covers to be also faced with a lining, so they may be taken off and refitted as required, or renewed when worn out. It is provided, further, that instead of covers there may be a continuous case surrounding the disk, with proper inlets and exhaust cavities, the invention contemplating a practical working rotary engine which shall have as few parts as possible and the utmost simplicity of detail.

### Feat of the Divining Rod.

The question as to the magical or the scientific value of the "divining rod" has just been reopened by the success which has attended its use at the Fletton Wagon Works of the Midland Railway Company, England, with reference to the discovery of a permanent supply of water. According to *The Sanitary World* (London), the company requires to use about 500 or 600 gallons of water every day, and the well on their premises yielded only one-half of that quantity. It was necessary, therefore, to supplement the supply by the sinking of other wells or by the construction of an expensive system of piping. The former plan was preferred, and two new wells were sunk to no purpose. The services of a gentleman of the district, who bore the reputation of being skilled in the art of discovering water by means of the "divining rod," were then called in. This wizard or expert employed for his purpose a forked hazel twig, holding one prong of the fork in each hand, the points of the fork being directed to the sky. After walking about the premises for some time, the point of the fork suddenly began to bend down, purely, as the best evidence goes, of its own accord, and to point to the earth. The wielder of the wand declared that here would be found a plentiful supply of water. The same indications were repeated at another spot, where the twig snapped from the violence of its spontaneous and sympathetic motion, and the same confident assertions were made with reference to the occurrence of water—assertions which the results obtained by actually sinking wells amply justified, the quantity of water to be obtained being apparently inexhaustible. Other persons essayed to use the wand, but it rebelled against the usurpation of its owner's functions, and remained contumacious and irresponsive. If any persons, adds the writer, require water in unlikely localities, it might be well to secure the services of this diviner before he volunteers for a patriotic mission in favor of the troops in the thirsty wilds of the Soudan.

### SAFETY GAS BURNER.

The body of the burner, A, is fitted with a diaphragm, B, in its lowest portion, formed with holes to allow the gas to pass to the tip. Upon the under side of the diaphragm is a slide valve, D, held to its seat by a flat spring attached to the diaphragm. The valve stem, G, of spring metal, rests in notches in the valve, in which its end is screwed to permit it to be adjusted; the stem passes out at the side of the burner, and upon its outer end is a nut. A spiral spring presses the valve to open it. At opposite sides of the burner are arms, I, extending above the tip; to one arm is pivoted a lever whose long arm is forked at its end to take upon the nut on the stem. A small rod, M, of brass, silver, or other metal having a high rate of expansion, is connected to the short arm of the lever and to the arm at the opposite side of the burner. By adjusting the nut, the valve is moved over the apertures, and thus retained when the burner is not in use. When the gas is to be lighted, the nut may be turned out so that the spring will open the valve, and then screwed up against the lever when the flame has been burning long enough to fully expand the rod, M. But it is better not to change the adjustment of the nut, the valve being opened by pushing the stem inward. In case the flame is blown out, the valve will be moved and the apparatus closed by the contraction of the silver rod.

This invention has been patented by Mr. Merry L. Pence of Lexington, Ky.

### COMBINED GRAIN DRIER AND COOLER.

In our issue of Sept. 30, 1882, we published an illustrated article describing a new invention for drying and cooling grain, seeds, coffee, etc., in one continuous operation; this machine went into immediate use, and has been operating very successfully ever since. The maker's claim of durability has been fully sustained, the first machine, after running three seasons, now being in good order and not having required a total expenditure

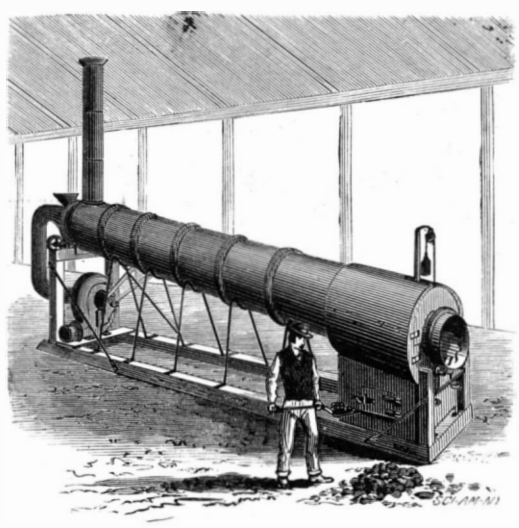
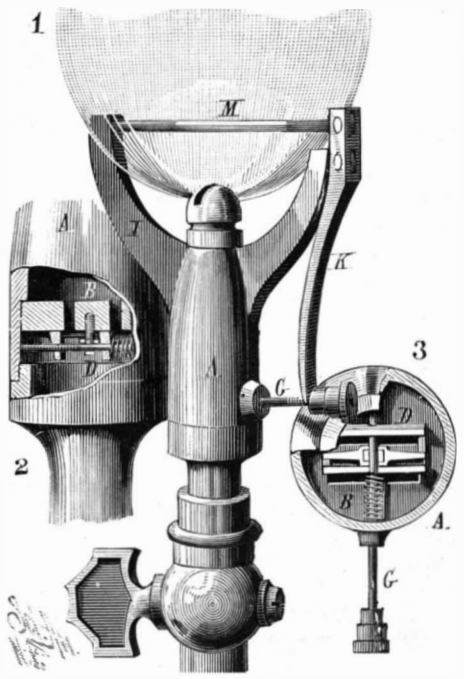


Fig. 1.—COMBINED GRAIN DRIER AND COOLER.

of five dollars for repairs. The inventor has recently added some improvements which increase the capacity and efficiency of the drier in further reducing the temperature of the delivered products; this is an important matter in warm climates, and also during a few summer months in the Northern States. These changes consist in increasing the heating surface by adding to the length of the furnace, thus saving fuel, and also in adding a supplementary cooling cylinder and exhaust fan, thus doubling the air current. The inventor has lately completed two new machines, which are illustrated so plainly in the engravings as to need but a short description.

Figure 1 is a portable drier, styled No. 1, of moderate capacity, adapted to the wants of small dealers. No cooling arrangement is shown, not being positively required in a machine of this size unless the room is limited. A new departure is taken in constituting the entire furnace of fire clay material, this being of much lighter weight and giving a better appearance than the conventional furnace of sheet iron lined with




PENCE'S SAFETY GAS BURNER.

brick. It is compact, occupying a floor space of only 2 feet by 20 feet, and strongly braced, so as to stand distant shipment and frequent removals. Motion is transmitted to the drying cylinder in the same manner as in the larger machine, by two grooved friction wheels of chilled iron or steel, each revolved by a sprocket wheel, and both being connected by one link-belt chain to the shaft back of the drier. This is an advantage over the former method of belts and pulleys, and has been adopted in all of these machines.

The exhaust fan is driven from the same shaft. A gate is placed in the air pipe for gauging the current to any required strength. The feeding hopper is shown at the left of the smoke stack. At the right can be seen the lifting screws for raising or lowering the end of the cylinder, to increase or shorten the time of the passage of the material through it, which should be varied according to the amount of moisture to be removed. The numerous troughs shown at this end extend the entire length of the case, lifting and dividing the grain into a number of thin falling sheets, thereby presenting a large surface for the air to come in contact with, in order to absorb and remove the moisture. Scorching cannot occur as long as the cylinder and fan are in motion. This machine has a capacity of 40 bushels of ordinarily damp grain per hour, weighs 4,000 pounds, and requires 2 horse power, consuming 60 pounds of coal; coke, charcoal, or wood can be used as fuel. The machine is well adapted for drying granulated tobacco and roasting coffee, for which purposes some slight changes are necessary.

Figure 2 illustrates the No. 2 improved driers and coolers, run in a gang, to meet the requirements of elevators or large operators. It has a capacity of 5,000 bushels damp grain per day of twenty-four hours, or double that amount if used alone for cooling purposes. No motive power is shown, as it is customary to locate plants of this size adjoining an elevator or warehouse, which furnishes power and storage facilities. As shown, it is arranged for drying damp grain supplied to it by the conveyer at the left, under which are seen the feed gates and spouts for dropping the grain through the suction bonnets into the drying cylinders, arranged as described above. Owing to the inclination of these revolving cases, it is gradually carried to the lower ends, being at the same time constantly subjected to the current of air drawn through the cylinders in the opposite direction by the exhaust fan.

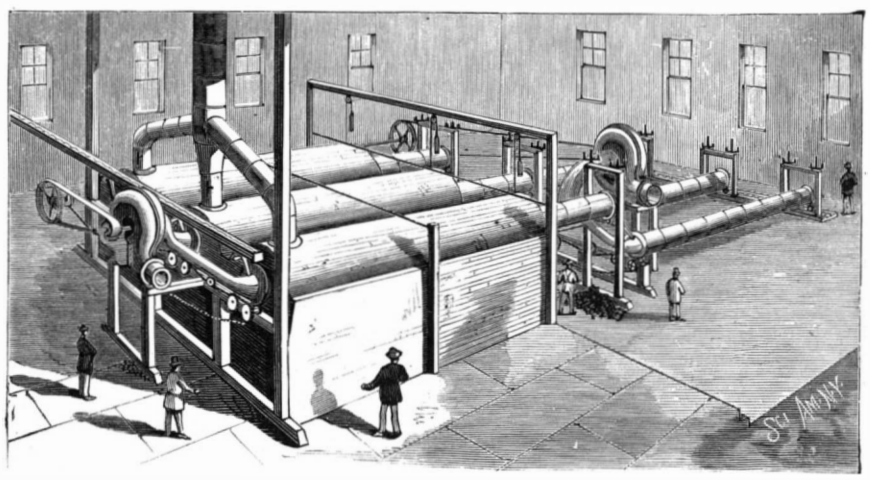


Fig. 2.—COMBINED GRAIN DRIER AND COOLER.

The grain now falls into the cooling cases and undergoes the same treatment, omitting the heat, after which it is discharged into the conveyer at the extreme right of the cut in a dry, clean condition (the continued friction and attrition with the metal surface scouring off the dust, which is removed by the current of air), ready for immediate grinding, shipment, or storage in bulk, with no taint, or so slight as to escape the notice of inspectors or millers. The patentee has a number of letters from millers who have used it for the highest grade flour. A single countershaft, carrying two pulleys and two sprocket wheels, drives the whole machine. The maker lays particular stress upon its very perfect

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adaptation to cooling "hot" grain. The following table has been prepared from actual measurements and practice:

| | |
|---|---|
| Total square feet iron heating surface | 591 |
| Total square feet iron cooling surface | 887 |
| Total square feet iron surface inside of cylinders | 1,478 |
| Total square feet grain surface exposed to air currents | 1,212 |
| Total cubic feet air drawn through the grain per minute | 7,338 |
| Total lineal feet traversed by grain during operation | 600 to 1,200 |
| Time of passage | 15 to 30 minutes. |
| Total weight of iron work complete, about | 19,000 lb. |
| Total horse power required | 18 |
| Cost of drying grain for one day of 24 hours: | |
| 4 tons of coal at $2.25 | $9.00 |
| 2 men, fireman and foreman, two days each, $1.50 | 6.00 |
| Cost of motive power at 50 cents per H. P. | 9.00 |
| Oil, etc. | 50 |
| | $24.50 |

Results—5,000 bushels dried at a cost of less than one-half cent per bushel.

| | |
|---|---|
| Cost of cooling "hot" grain for one day of 24 hours: | |
| One foreman, 2 days' time, at $1.50 | $3.00 |
| Motive power | 9.00 |
| Oil, etc | 50 |
| | $12.50 |

Results—10,000 bushels at a cost of one-quarter of one cent per bushel.

It requires a space 48 feet long, 24 feet wide, and 12 feet high, but these can be reduced somewhat when necessary. In order not to injure the grain, the time required for the removal of moisture can be increased by adding a series of return conveyers, by which the grain, after it has passed through the first drier and cooler, is returned to the head of the second set, and so on until it has passed through the whole gang. Its passage can be retarded to any extent by bringing up the discharging end nearly to a level.

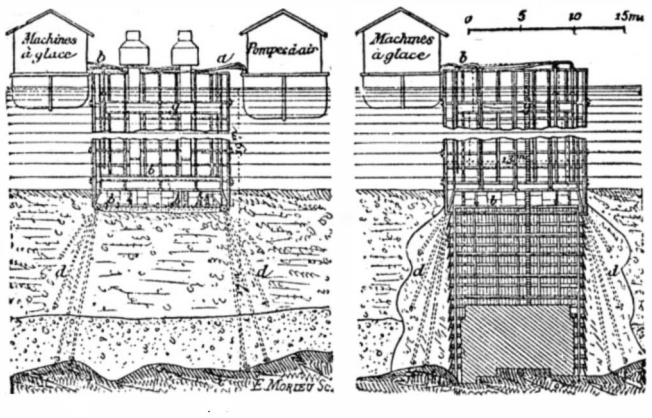
The maker claims superiority on the following important points: Economy of operation, drying and cooling in one operation, simplicity and durability, requiring no expert labor, perfect results, ability to use any kind of fuel, frictional instead of cog gearing, cool and clean operating room, and no extra-hazardous insurance rate.

Machines furnished only by the patentee, Mr. Stanley E. Worrell, Hannibal, Mo., who will supply further information upon application.

### THE SINKING OF SHAFTS BY FREEZING.

The sinking of mine shafts by freezing was first practiced by Mr. Poetsch at the Archibald Mine. The method consists in driving into the earth, around the perimeter of the shaft, a series of pipes that are closed at the bottom and that contain other pipes. A freezing mixture forced into the inner pipes ascends through the annular space and is forced by a pump to a refrigerating machine in order that it may give up the heat recovered and then begin the same travel again.

Mr. Poetsch's experiment, as conclusive as it was, was performed upon a shaft of 18 feet depth, only, sunk through wet quicksand. So Mr. Haton de la Goupillere, in briefly describing the operations before the Societe d'Encouragement, expressed the opinion that it would be absolutely rash to undertake to sink very deep shafts by such a process. New attempts have nevertheless been made since with entire success at the Centrum Coal Mines at Konigs Wusterhausen. Here 108 feet of quicksand were frozen in 33 days with 16 pipes analogous to the preceding. The mass solidified around the circumference of the shaft was ten feet thick. At the Emilia mine likewise a 9 foot shaft was sunk through a 118 foot stratum of quicksand.




SINKING SHAFTS BY FREEZING.

In these different operations, the temperature, which reached —19° at the bottom of the shaft of the Archibald mine during the last days of the experiment, was taken only at the moment of the observer's descent. After remaining at the bottom for a certain length of time the temperature of the air gradually rose, and when several workmen were occupied permanently at the bottom it remained at a temperature of between 0·5° and 1°. So, after quite a short period of reheating of the air, the cold caused no inconvenience to the workmen, but, on the contrary, rather braced them up.

One of the most interesting peculiarities is that the congelation is sufficient to allow the quicksand and the surrounding earth to be taken out in a single block. At the Archibald mine, for example, when the stratum of lignite was reached it was found that the earth was frozen to over a yard beneath the extremity of the pipes, and the top of the stratum was so intimately cemented to the superposed quicksand that pieces could be broken from the mass without a fracture occurring at the plane of separation of the layers.

This fact proves that the Poetsch system may be applied with equal efficacy, whatever be the inclination of the strata, since the congelation converts the earth into a perfectly homogeneous mass. It might in certain cases especially be employed in the driving of submarine tunnels, and the *Engineering News* observes that the Hudson River Tunnel would be particularly suited for the application of it, since the stratum of sand and mud at the bottom has a very uniform composition, and would permit of working at every operation over lengths of from a hundred to a hundred and fifty feet.

A close examination of the frozen portions has demonstrated that the thickness of the block of ice increases with the depth. This is due to the fact that, through the direction given the freezing mixture, the maximum of its action is exerted at the base of the pipes. There forms, therefore, around each of the latter a truncated cone of ice whose larger base is situated beneath. These truncated cones gradually increase and finally penetrate each other, until the whole earth forms but a single block of ice.

We may conclude from the results obtained that, with a circular shaft, congealed earth over a yard thick permits of the sinking of a six and a half foot shaft without lining. The pipes are driven in different ways. When the shaft is already sunk up to the level of the water, and the stratum of wet earth is not very thick, it suffices to drive the pipes into the sand by removing the latter from the interior by means of a sand pump. In wet earth of some depth, a boring machine is employed. This puts down four pipes at once. If the strata to be traversed contain erratic blocks, the latter are avoided by inclining the hole, or, if they are too large, they are traversed by a special tool.

Mr. Poetsch proposes to apply his system to the constructing of bridge piers, and has just made a contract with the government of Roumania for the construction of the twelve piers of the great Bucharest Bridge.

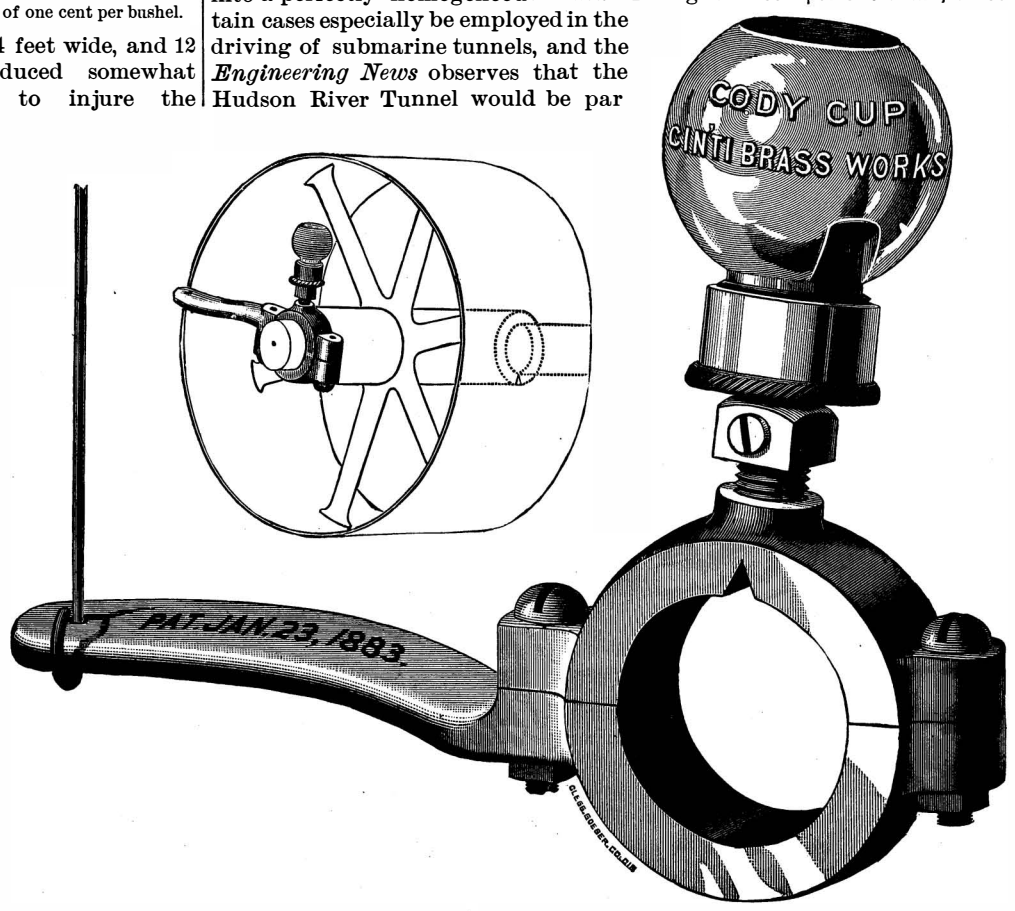
According to the *Techniker*, it is his intention to proceed by two methods. The first (Figs. 1 and 2) constitutes a combination of the compressed air and freezing methods. After sinking the working chamber by ordinary methods twelve or fifteen feet beneath the bottom, the freezing pipes will be driven beneath and around its perimeter in such a way that the whole mass contained in the cavity to be formed above the rock may be taken out in a block. The caisson will then become water tight, the air lock will be removed, and the work will be effected in the open air.

In the second process the use of compressed air will be dispensed with. After sinking an open caisson over the location of the pier, the pipes will be driven. After the freezing has been done, the water will be removed from the caisson by pumps, and the work will be performed in open air.

In order to preserve the masonry from the freezing action of the surrounding mass, it is Mr. Poetsch's intention to line the side of the cutting with a layer of straw, and to form the joints with a mortar of sand and tar or asphalt.

The experiments of Mr. L. Malo have demonstrated, moreover, that masonry with asphalt joints is susceptible of perfect cohesion.

The Poetsch method, which now appears to have entered into practice for sinking shafts in wet earth, presents the great advantage over all previous systems of allowing the cost and duration of the process to be exactly foreseen. Besides, it secures a vertical sinking of the shaft, since the operation is performed in solid earth; it completely dispenses with pumping apparatus, and does away with those special difficulties entirely that originate in the inclination of the moist strata.—*La Nature.*




LUNKENHEIMER'S AUTOMATIC LOOSE PULLEY OILER.

### AUTOMATIC LOOSE PULLEY OILER

The great obstacle which has heretofore prevented the successful oiling of loose pulleys has been that centrifugal force kept the oil away from the bearings. The oiler herewith illustrated (shown detached and in place upon the shaft in the figures) overcomes this objection, and is simple in its construction, which will be easily understood from the engravings, durable, easily applied, and very perfect in operation. In addition, it is economical, the manufacturer stating that one ounce of oil is sufficient for several months. It requires a space of three-fourths of an inch on the shaft, upon which it is set loosely so as to bear against the hub; it is kept in place by a slip collar, unless it fills up the space between the hanger and loose pulley. To keep the oiler stationary, a hole is provided in the arm to fasten a wire, which can be attached to the ceiling or wherever convenient. On wide pulleys a slot or groove should extend through the entire length of the bearing and terminate in a V-shaped notch. As this will cause a suction, prevent a vacuum, and freely supply oil from end to end of the bearing, the feed is regulated by means of a slotted screw working like a common stop cock.

Full particulars can be obtained by addressing the manufacturer, Mr. F. Lunkenheimer, proprietor Cincinnati Brass Works, Cincinnati, O.

### COVER FOR COOKING UTENSILS.

The engraving represents a cover for cooking kettles

GOODALE'S COVER FOR COOKING UTENSILS.

or utensils lately patented by Laura M. Goodale, of Marshalltown, Iowa. Fig. 1 shows a coffee pot and Fig. 2 a kettle arranged with this cover, which is shown detached in Fig. 3. Within the lower portion of the cover,

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and extending for any desired distance from its front, is a strainer made of wire gauze or perforated sheet metal. In the front side of the cover, within range or line of a spout projecting therefrom, is a slide controlled by a knob from the outside, which serves to uncover or close, as required, the outlet in the cover over the spout. By means of this combined cover and drainer, the contents of the kettle may be drained by suitably inclining the kettle. The slide allows the water and steam to escape without coming in contact with the hands, and may be more or less opened to allow steam to escape and prevent boiling over. A steaming chamber is formed between the strainer and top of the cover, in which articles may be placed. A kitchen utensil of this description will be found convenient and useful; and as the improvement is in the cover, it may be readily applied to kettle bodies of ordinary construction. In applying the cover to tea and coffee pots, wire gauze is used instead of perforated metal.

## Correspondence.

### Burn the Garbage.

*To the Editor of the Scientific American:*

In regard to your article of March 7, on "The Proposed Garbage Burning in New York," I beg leave to make some suggestions, having for many reasons given the subject more than usual attention and study, and, I think, mastered most of the matter published in your columns for many years in regard to it. Burning the refuse before decay, fermentation, or putrefaction commences, is the true solution of the difficulty. It is not my purpose to claim this as an original plan, nor to startle the public with something new; it is as old a sanitary regulation as the days of Moses, though as new in some respects to some people as the latest discoveries of European laboratories in health matters.

My suggestion is, while you are experimenting with a $50,000 appropriation, and expending a million annually for street cleaning purposes, to get the help of your individual citizens by press appeals, and teaching, and let every family daily burn, cremate, destroy, as much of their garbage as will be found practicable. Your professional men, merchants, and mechanics know enough of elementary chemistry to understand that garbage, composed mainly of animal and vegetable matter, is converted by fire into ashes and vapory matter, and the latter, before burning, gives that weight and bulk to garbage which heretofore has rendered its transportation unprofitable and expensive. Clean ashes may be hauled and used for many economic purposes, and your crematories, when built, will have plenty of filth to keep them active without the garbage of may be two hundred thousand homes. In view of the many columns written upon the "cholera," which has not yet come and I hope will not, it may be worth taking into serious consideration, what effect would the removal of this garbage have upon the general health, what would be its cost, and what moral effect would the daily destruction by burning practiced by families for private and public good?

The plan I think is good, cheap, and must, if generally carried out, lower your very high death rate.

J. M. WORTHINGTON, M.D.

Annapolis, Md.

### Formation of a New Elbow Joint.

*To the Editor of the Scientific American:*

I herewith transmit to you a record of one of the most brilliant operations in modern surgery, to which my attention was called upon its occurrence, and which I have watched with deep interest to its successful termination. On the 17th day of August last, John Danielson, a Swede, in the employ of Palmer & Nichols, lumbermen, a short distance from this city, while engaged in sawing a log was struck by a falling tree. The left arm was caught at the elbow, between the tree and the log, producing both dislocation and fracture at the same instant.

The bones composing the joint were broken into small fragments. Upon receiving the blow, the man probably fainted, as this was the last he remembered for several moments. This particular kind of injury has always been considered very grave, on account of the intense inflammation and swelling succeeding. As a rule, amputation is resorted to at once, and in aggravated forms is the only alternative. Mr. Danielson was at once admitted to Mercy Hospital in this city, under the care of the hospital surgeons, Drs. Groner and Burkart. The day following the accident, the patient being under the influence of anæsthetics, Dr. F. J. Groner performed the operation, assisted by his colleague Dr. Burkart. The articulating surfaces of the humerus, together with about two inches of the shaft of the bone, the head and neck of the radius, and the upper end of the ulna—all more or less crushed and splintered—were removed; the quantity of bone filling a sixteen ounce bottle. The wound was now dressed, by placing the arm in an obtuse angled splint having a hinged joint corresponding with that of the elbow, so that at the proper time the forearm could be flexed or extended, and the position changed as required.

A large douche filled with ice water was suspended above the patient, and a very small stream was allowed to drop on the coverings of the wound constantly for ten days, in order to prevent supervening inflammation. The patient was placed upon a non-stimulating diet, and no unfavorable symptoms followed. In five weeks the wound was closed; and in five months the patient began to work. At the present time Mr. Danielson has a very satisfactory elbow joint, which time will render still more perfect, slightly enlarged, but exceedingly useful, and he is again in the lumber woods, and fully capable of performing all kinds of labor.

F. A. H.

Big Rapids, Mich., March 4, 1885.

### Agricultural Machinery Abroad.—II.

We present herewith a second article on the agricultural industries of some foreign countries, compiled from the resident consuls' reports to the Department of State.

*Silesia.*—Henry Dittmar, Consul at Breslau, thinks that since the price of sugar beets has fallen from 22 c. to 15 c. a hundredweight, the thousands of acres which were transferred from the producing of rye, potatoes, barley, and oats to the growing of sugar beets will, owing to the reduced price of the latter, be devoted again to raising the variety of cereals as formerly. Steam plows have been used in sugar beet fields, and harvesters, binders, cultivators, etc., have been in almost general use since the prosperous years following the war of Germany and France. But, owing to the greater supply of cheap labor of later years, some of the labor-saving inventions, notably the reaping machine, have fallen into partial disuse, and the cheaper German imitation machines have supplanted, to a great extent, the American manufacture.

Mr. Dittmar mentions an annual machinery fair, held in Breslau, in the month of June, at which there were two hundred and forty-nine exhibitors, almost exclusively of agricultural machines and implements; but, he adds, there were fewer articles of American manufacture at the 1884 exhibition than were to be seen in previous years. He alludes to an American pulverizing harrow which attracted considerable attention, it being the first time it had been exhibited.

Allusion is made to the effort, some ten years ago, to introduce the American portable engines and steam thrashing machines, but they met with no success. The only way to get American machines introduced into Silesia, Mr. Dittmar thinks, is to send a set of agricultural machines to some responsible man, and with a privilege of hiring them out during a season; and if they worked satisfactorily, it would be a good advertisement, and enable them to enter into successful competition with the English machines which now control the market.

*Holland.*—Consul Eckstein, of Amsterdam, and John F. Winter, Consul at Rotterdam, both state that English agricultural machines and implements are mostly used, but, as reported in most other northern European countries, hay and manure forks, shovels, spades, rakes, and such like implements of American manufacture are in demand, and find ready sales.

In style and finish, Mr. Eckstein says, the American implements are conceded on all sides to be superior to those manufactured elsewhere; but the idea prevails that they are usually too weak for the heavy soil of Holland, and, therefore, the farmer prefers the clumsier but stronger machines of English make.

Mr. Winter adds that the Dutch farmers have different ideas about the construction of their implements from what the Americans have, and the manufacturers will consequently have to acquaint themselves with the changes that their products will have to undergo in order to give satisfaction in that country.

*England.*—Mr. Louis A. Lathrop, Consul at Bristol, gives a very extended report on the English manufacture of machines, which he accompanies with engravings of their style and construction, with list of prices the manufacturer sells them at. He does not think it will pay our manufacturers to attempt the introduction of agricultural machinery into England, although he thinks it possible to make some sales by sending wide-awake agents with machines to the Royal Agricultural Society's annual exhibition. Prizes are awarded for novel and useful implements in successful operation at these fairs. He warns our manufacturers against thinking they can command a market for their goods in England without the most persistent effort.

No half-hearted trial, says Mr. Lathrop, will succeed; no occasional sending of circulars or samples to an English commission agent will build up a trade in these lines. It must be a siege, not an assault; and it must be conducted with forethought, resolution, and patience.

Consul Shaw, of Manchester, confirms the opinion of Mr. Lathrop in respect to the best mode of introducing American machines, which is to exhibit at the fairs and shows in the leading agricultural centers. The English farmer wishes to see with his own eyes what a machine can do, and he is not likely to purchase on the testimony of others.

As a rule, English farmers are slow to adopt new inventions. Novelty does not captivate the average English farmer. An invention must be fully proved before a ready sale can be relied on. "The old way" has charms for the great majority, and for this reason it is slow work to introduce useful labor-saving inventions among them.

When confidence is once established and prejudices overcome, the way is easy to success.

The English builders, adds Mr. Shaw, follow closely on the lines of American manufacturers, and it is vitally necessary for every American inventor to at once take out an English patent, so as to protect any new improvement on this side of the ocean.

Jasper Smith, U. S. Commercial Agent at Nottingham, reports that R. Hornsby & Sons and T. & F. Howard manufacture great quantities of reapers, mowers, fanning mills, harrows, plows, hoes, rakes, and other agricultural implements, many of the patterns being copied substantially after American patterns. Mr. Smith mentions especially of Messrs. Hornsby's style of reapers and mowers being eminently like those of Messrs. McCormick's and Walter A. Wood's manufacture. Mention is made of the extensive use of steam engines for thrashing and other agricultural work.

*Ireland.*—Consul Piatt, at Queenstown, states that in his district the agricultural tools, implements, and machinery employed, on the small farms, and even on large ones in remote districts, are of a very primitive description, consisting for the most part of the old Scotch swing plow, sowing machine, and grubber. There are no cultivators or wheel plows in use, and in these districts the most simply made and cheapest plows, harrows, and mowing machines are the only ones salable. Food-preparing and such like machinery is scarcely known, or, if known, its value in the economizing of labor, etc., is not certainly appreciated. In the more enlightened centers, however, and on the large and well managed farms, all the best machines of American and English manufacture are partially employed, and their use has been gradually extending. American and English made machinery very generally prevails in the Cork district. Plows, harrows, grubbers, mowing and reaping machinery, are imported from England, and mowing and harvesting machinery from America. In Kerry, where agriculture is perhaps more backward than in any of the other counties, there are very few American machines in use. As to how our American manufactures of machinery compare with those of other countries, Mr. Piatt says there is a diversity of opinion, except in respect to harvesting machinery, the superiority of which is conceded on all sides.

With regard to the tillage machinery, an idea prevails—and largely prevails—that though it is cheaper, it is not so good or lasting as that imported from England. The American made machines are found to be too light in construction, and not so well suited as the stronger made article which comes from England, for dealing with the hard, stony soil of Ireland. In Limerick County, where the soil is more loamy than in other parts of the province, the general run of American made machinery compares more favorably with the English than is the case in other counties.

Purchases are made by the farmers on long credit, which American manufacturers are not used to, and do not like. On the whole, Ireland does not seem a very encouraging market for American agricultural machinery.

*Scotland.*—Oscar Malmros, Consul at Leith, gives a very voluminous and interesting account of the agricultural affairs and products of Scotland. The principal American agricultural machines sold and used are the mower, reaper, and binder, not less than ten thousand sheaf-binding reapers having been sold in a single year. No machinery, implements, tools, etc., for use in agriculture are imported from any country except the United States.

For many years American reaping and mowing machines and sundry other machines and implements of American manufacture have had the preference with skilled agriculturists, although much prejudice existed, and to a great extent still exists, in favor of heavy, cumbrous implements, etc. But while the less skillful or less advanced farmers are gradually growing away from such prejudice, the British machinist is accommodating his manufactures to the improving taste of the farmer, and making them lighter, substituting malleable for cast iron in some instances, and introducing steel for iron in others, thus bringing the various articles in closer resemblance to those imported from the United States.

American manufactures, beyond question, compare favorably with British. No others are in competition with them.

A SOLUTION of oxalic acid has been used for removing ink stains from cotton, linen, or the fingers, but it is attended with the danger of injuring textiles and the skin. A much safer and better treatment of ink or rust stains consists in the application of two parts of powdered cream of tartar and one part of finely powdered oxalic acid. Shake up the ingredients well together, and apply the powder with a dry rag to the dampened stain. When the spot has disappeared, the part should be very well washed.

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## IMITATION OF ELECTRO-PHYSIOLOGICAL APPARATUS AND ELECTRIC TUNING-FORKS BY HYDRODYNAMIC TUNING-FORKS.

The imitation by hydrodynamic way of the effects of electricity and magnetism has led me to devise an apparatus which I call a hydrodynamic tuning-fork, and which vibrates continuously under the action of a current of water, compressed air, or steam (automatically interrupted), just as electric tuning-forks do under the influence of an electric current.

The construction of this apparatus is based upon the following principles:

1. When two currents of water of opposite direction, and directly facing each other, are issuing from nozzles with thick tips or provided with small disks, there is an attraction of such currents (one of which, at least, is supposed movable) when the distance between the apertures is but a few fractions of an inch; and this attraction very quickly increases in measure as the distance diminishes.

2. If, on the contrary, the nozzles have thin tips, there is a repulsion.

3. When the currents are not exactly opposite one another, there is produced, when they meet, an axial direction that tends to bring them to a parallelism and a coincidence of axes. In all cases there may be a vibration.

Applying these results, I have had several instruments constructed that have nearly the form of the tuning-forks used in acoustics. I shall describe but one of them.

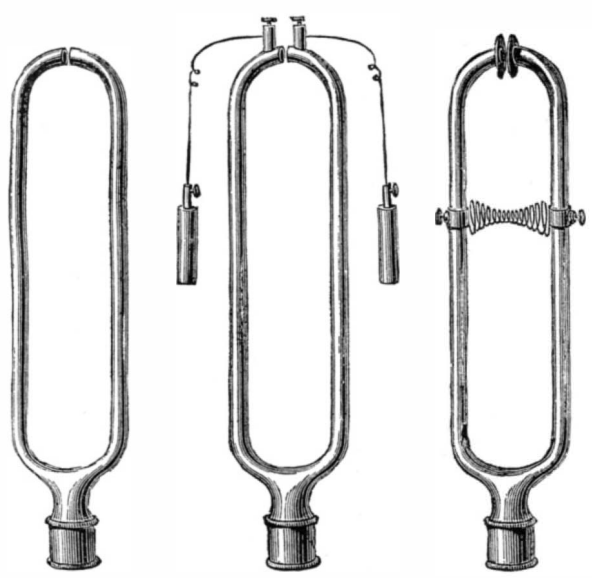
It consists of a U-shaped brass tube (Fig. 1), 20 inches in length, ¼ inch in internal diameter, and $\frac{1}{25}$ inch in thickness, whose two parallel arms are 2½ inches apart.

The center of the curved part contains an aperture that puts the tube in communication with a nozzle of ½ inch internal diameter that screws on to a pipe fed by the city water. The upper part of each arm is curved so as to bring the extremities exactly opposite each other, and nearly in contact. To these ends there may be adapted disks or pieces of various forms, plane or curved, and with thick or thin edges (Fig. 2).

The apparatus being fixed in any position whatever, or held by hand, and the arms being properly spaced, if we cause a current of water to enter it, it will at once spontaneously begin a regular vibratory motion, through *attraction* if the nozzles are thin at the extremity or are provided with disks, and through repulsion if the contrary is the case. Upon placing the entire apparatus, or only the free extremities, in water, it will work very well, and the experiment is much more conveniently performed.

By separating the arms further, they may be kept from striking at every vibration, and the sound will then be clearer, and it will be easier to get the height of it. In such a case I have found that the instrument, without disks, gives the note $la_1$ (217·5 simple vibrations per second) as its fundamental. But at the same time the harmonic $la_2$ is perceived.

In measure as the arms of the apparatus are taken



**Figs. 1, 2, and 3.—HYDRODYNAMIC TUNING FORKS.**

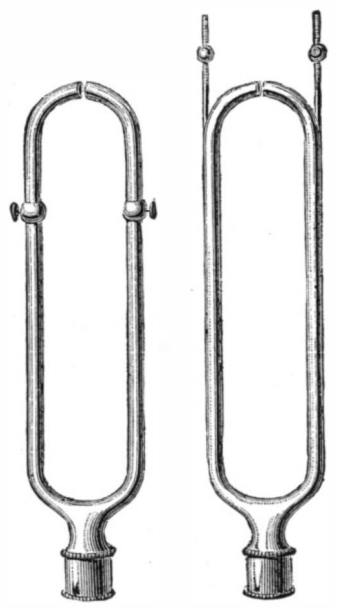
out of the water, the sound rises, and when they are entirely out of the liquid, it will have reached about a third.

In these different cases, in order to have a sound occur, it is necessary to change the regulation of the instrument; but when once it has been primed, it will continue to vibrate regularly as long as the experimental conditions are not too much modified. On compressing the arms of the apparatus with the hand or a spring, the vibratory velocity is slightly increased. On closing the cock more or less, that is to say, on diminishing not the pressure, but the quantity of water that enters within a given time, we do not perceptibly alter the vibratory velocity, but we diminish the intensity of the sound emitted, consequently the instrument tends to stop.

I doubt not that, with shorter and thicker apparatus, and a stronger current, we would obtain higher tones.

It is with the apparatus (Fig. 1) thus operating, and its extremities dipping into water, that I have noticed the very marked trembling that is felt by the hand that is holding it—a sensation entirely analogous to that which is experienced when, with both hands, a person touches the rheophores of a voltaic or induction apparatus of feeble intensity.

On attaching the arms of the apparatus to rheophores, by means of wires (Fig. 2), we obtain vibratory effects that are capable of being graduated at will, like the shocks from an electric apparatus. When the extremity of the arms of the instrument in vibration are



**Figs. 4 and 5.—THE SAME, WITH REGULATORS.**

touched, the figures are carried along on the same side, as they are by revolving vibrations.

On placing the pipe that leads the water into the apparatus against the ear, we hear a loud noise, like that of a torrent.

Upon holding any part of the said pipe (or, better still, one of the arms of the instrument) between the teeth, we feel an almost painful sensation, such as would be produced by an electric apparatus in which the current was interrupted.

In order to produce intenser effects, we might, instead of a single hydrodynamic tuning-fork, employ several simultaneously, either in unison or of different heights, or construct an apparatus of large dimensions actuated by so energetic a current that the contact of the hands of several persons could not arrest the vibratory motion.

With a hydrodynamic tuning-fork double the length of the one here described, and the arms of which have purposely been made crooked, there occur very strong, irregular vibrations under the influence of axial attraction. It is probable that vibrations of this nature exist (although difficult to verify) in the first apparatus, seeing the almost inevitable want of perfect coincidence between the axes of the opposite tubular extremities, without counting the longitudinal vibrations that are transmitted to the support. Ordinary tuning-forks themselves are not free from such a complexity of vibrations.

The form, dimensions, and nature of these apparatus may be modified in various ways. It would be possible, for example, to get up a form with straight arms, like ordinary tuning-forks, although it would be necessary to construct it partially of rubber, or else make it of metallic tubes of very narrowly elliptical section, or of metallic tubes grooved within.

These apparatus are all capable of likewise operating with currents of compressed air or of steam.

Thus a new relation is established between sonorous, hydrodynamic, and electric phenomena.

But there is one application of these apparatus that still further assimilates them to electrical ones, and that is that we can make the former serve for keeping up continuous vibrations in an ordinary tuning-fork, through immediate communications or through a solid intermedium. Here the current of water, interrupted automatically, replaces the electric current of electric tuning-forks.

In order to obtain such an effect, we regulate the hydrodynamic instrument by means of a spring applied to the arms, and the tension of which is varied at will, or by means of an annular or spherical slide that is to be fixed at the proper height, or by adding rods with movable balls to the arms, as in the Foucault mercurial interrupter (Fig. 5), or finally, by constructing the arms so that they will slide in and out, in order to increase or diminish the vibrating lengths according to circumstances.

As for the method of communicating the vibratory motion from one fork to the other, that can be done in several ways: (1) The two instruments being firmly fixed by their bases, an arm of the one may be connected with an arm of the other by means of a straight or helix-shaped wire. On regulating the motion of the apparatus by means of the arrangements just indicated, a synchronous motion will be communicated to the tuning-fork (Fig. 6). (2) The transmission may also be effected without an intermediate wire, by directly arranging the vibrating arms of the hydrodynamic fork on each side of those of the ordinary tuning-fork, and nearly in contact, in such a way that the discontinuous current (of compressed air) shall strike against them externally (Fig. 7). (3) The hydrodynamic instrument might also be small enough to allow its arms to be placed between those of the tuning-fork, and to act upon the latter like a spring (Fig. 8).

In order to complete what has reference to hydrodynamic tuning-forks, I shall cite one other application that may be made of them, although it is not directly connected with the comparison with which we are occupied. We might, in fact, employ the apparatus as a water meter by utilizing its regular, vibratory motion for putting a dial mechanism in motion. In order to give an idea of the operation of an apparatus of this kind, I shall cite two experiments that I have performed for the purpose of determining approximately in what ratio the discharge of water can vary when the tube is in vibration, as compared with that which takes place when the flow is free or continuous, all other conditions being the same.

It is evident that such comparative discharge may be expressed by the inverse ratio of the time that the instrument takes to fill the same vessel with water under each of the preceding conditions. Now,

1. With a converging nozzle, thin at the extremity, vibrating, it requires 2 m. 40 s. = 160 s. to fill the same vessel; non-vibrating, it requires 1 m. 40 s. = 100 s.—figures that have the ratio of 3 to 2.

2. With a cylindrical nozzle, thin at the extremity, vibrating, it requires 1 m. 30 s. = 90 s. to fill the same vessel; non-vibrating, it requires 1 m. 12 s. = 72 s.—figures that are as 5 is to 4.

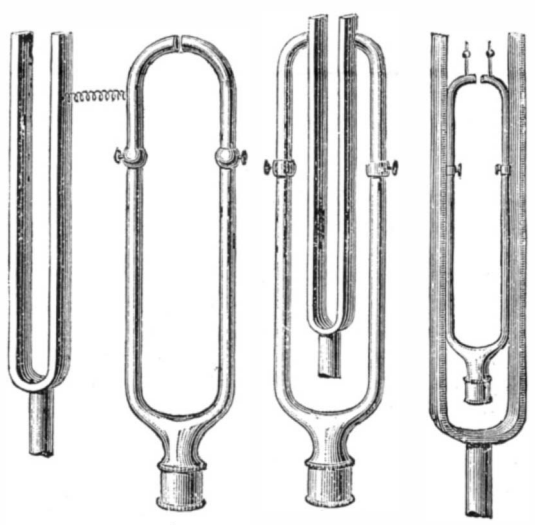
According to this, the discharge of water through the vibrating apparatus would be, in the first case, $\frac{3}{5}$, and in the second $\frac{4}{5}$ that which the apparatus would give were the flow continuous.

It will always be possible by means of the regulation of the instrument to cause the velocity of the vibration to vary so that the discharge of water shall be a given and fixed fraction of that of the free flow.

Reciprocally, we might substitute an electric tuning-fork for the hydrodynamic one, or simply an electromagnetic apparatus, in order to regulate the velocity of the liquid's flow and make a water meter of it.—*C. Decharme in La Lumiere Electrique.*

### Compressed Coal.

M. Escalle, director of the works at Tamaris, sends to the *Revue Industrielle* the following particulars in regard to the employment of blocks of compressed coal in lieu of coke for blast furnaces. With the ores of the country (which are argilo-silicious and small) the quantity of compressed fuel employed is 20 per cent; but with those of Motka or Pilhals it reaches regularly 30 per cent. It has been found that by the use of these blocks a much higher temperature of hot blast is obtained, and that the proportion of combusti-



**Figs. 6, 7, and 8.—APPLICATION OF THE APPARATUS TO KEEPING UP VIBRATIONS IN ORDINARY TUNING FORKS.**

ble consumed—coke and compressed coal included—per ton of pig iron produced is less than with coke alone. M. Escalle attributes this result to the quantity of water (1½ per cent) contained in the compressed coal blocks used by him, as well as to the nature of the volatile matters. These blocks have given, on analysis, the following results:

| | By Volume. | By Weight. |
|---|---|---|
| $CO_2$ | 2·60 | 5·17 |
| O | 8·90 | 15·88 |
| CO | 3·50 | 4·43 |
| $C_2H_4$ | 14·00 | 10·14 |
| $C_4H_4$ | 48·80 | 63·00 |
| H | 20·20 | 1·82 |
| N | 2·00 | 2·53 |

The volume of gas obtained per ton of the compressed fuel was 7,620 cubic feet.

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### THE IMPROVED HAND LOOM EUGENIE.

The annexed cut, taken from the *Illustrirte Zeitung*, shows a new hand weaving machine or loom invented by Miss Eugenie Wernicke. By means of this apparatus, silk, wool, yarn, cords, strips of fabric, etc., can be woven into pieces that can be used for pillow-covers, shams, curtains, parts of dresses, etc.

In using the machine, the warp threads are first arranged parallel, either on the backs of two chairs or secured to the knobs of two doors. The warp threads are then passed through the heddles, arranged on suitable frame, and then the ends of the warp threads are tied together and fastened to the back of the chair upon which the person operating the loom sits, and the other ends of the threads are held in a suitable clamp on the table. The heddle frame or comb is raised by means of the left hand, whereby the threads are separated, and then the shuttle is passed through the warp threads, the warp threads shifted, the shuttle passed through in the inverse direction, and so on. Different fancy patterns can easily be produced on the machine. It is evident that broad pieces cannot be woven, and the machine is designed only for producing long strips for household use.

THE IMPROVED HAND LOOM EUGENIE.

### THE IMPROVED HAND LOOM PENELOPE.

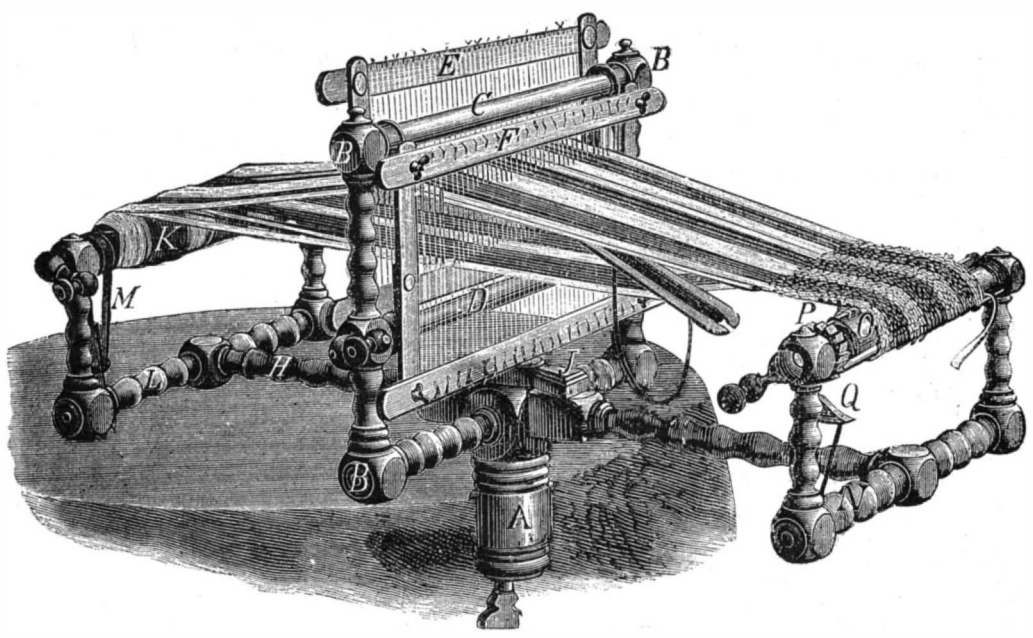
The holder, A, is provided with a screw for holding the entire apparatus on a table, and on the said holder an upright frame, B, is held, which is provided with rollers, C D, over which straps pass for raising and lowering the heddle frames, E and F, in which heddle frames heddles of the usual construction are held, provided with eyes through which the warp threads are passed. Two hinged arms, G and H, are fastened by means of hinges on the holder, A, and can be locked in place by means of a latch, J. The warp threads are secured on the warp beam, K, mounted on a frame, L, on the end of the arm, H, and is provided with a crank for turning it, and with a spring, M, for locking it in place.

The cloth beam, O, is pivoted in the frame, N, on the end of the arm, G, and is also provided with a crank and with a locking device. The heddle frames, E and F, are worked up and down; when one is raised the other is lowered, and thereby the warp threads are separated, and the shuttle can be passed through them. No lay is used for driving the threads home, as this is done by the operator, who pulls the threads taut after having passed the shuttle.—*Illustrirte Zeitung.*

### Petroleum in Russia.

The Russian oil region covers an area of over 14,000 square miles, with forty-two oil wells in one district, over a hundred in another, four hundred in a third, and richer regions waiting to be developed to produce still greater results. One spouting well produces, it is said, two millions of gallons a day. The oil is found in places at a depth of a hundred feet, and no well has gone below eight hundred and twenty-five feet. Three Swedish brothers, and a few others, Americans and Englishmen, as well as Russians, who have been in America, have introduced method and system, pipe lines, oil-carrying barges and steamers, tank cars, refineries, joint stock companies, railroads, and now produce 800,000 tons of crude and 200,000 tons of refined petroleum, and are rapidly finding new markets. In America there are over 25,000 drilled petroleum wells; in Baku, the Russian oil region of most activity, there are 400, but a single one of these, it is claimed, has thrown up as much oil in a day as nearly the whole of the 25,000 in America put together.

Spouting wells in Russia are both frequent and constant, and the overflow is sometimes a serious difficulty, in some cases run into the sea or low land, and burned to get rid of it.




THE IMPROVED HAND LOOM PENELOPE.

### Revolution in the Iron Trade.—Making Steel Cheaply.

In another column the reader will find an interesting account of the progress steel has made toward displacing wrought iron, and there appears another statement, in the New York *Tribune* from a Pittsburg correspondent, which seems to confirm the fact that steel is to take the place of iron in most places where the latter has been used. The metal manufacturers seem to be alive to the change which has come over the public in its appreciation of the superiority of steel.

Early last year people about Pittsburg had their curiosity much aroused by mysterious performances at the works of Oliver Brothers. A part of the establishment was carefully boarded and locked, and jealously guarded from all intrusion, and for a long time nobody was admitted. Indeed, while everybody wondered what was going on, and among iron workers particularly a great deal of curiosity was excited, the secret was so well kept that the nature of the operation did not become known to anybody until in the last month, unless it be to those who had special information of the affairs and prospects of the great firm of Oliver Brothers after its suspension. But now, through papers submitted at the annual meeting of the American Institute of Engineers and publications in local journals, the public is assured that a new process for working iron has been thoroughly tested, and has not only met the scrutiny of experts, but has demonstrated its immense practical value.

Its effect upon the future wages of skilled iron workers will probably be appreciated from the statement now made, that, while steel of a peculiarly excellent quality, and specially adapted to many uses in preference to malleable iron, has been produced in large quantities and placed upon the market, only one workman in the whole establishment has needed such skill or training as to receive wages averaging as much as $2.50 a day. By the new process, which is entitled the Clapp-Griffiths process, the silicon is so completely removed from the iron that, notwithstanding the presence of a proportion of phosphorus usually found fatal, steel of a high grade and of a remarkably useful quality is made. To the practical iron worker, however, the most startling fact remains that the cost of this treatment is less than half the present cost of making the ordinary pig iron into muck bar.

At the wages now paid in Pittsburg, it is reckoned that it costs $12.75 per ton to make muck bar from pig iron, but by the new process a metal far more useful, in better shape for handling, is produced at less waste, with a cost of only $6 a ton added to the cost of the pig. Moreover, it is shown that, by applying the comparatively inexpensive plant required in this process in connection with ordinary blast furnaces, and taking the molten iron as it is required hot from the blast furnace for treatment in the converter, the cost of producing the ton of steel will be only $3 or $4 more than the cost of producing the ton of iron.

In the last year, adds the writer, Oliver Brothers & Phillips have turned out many hundred tons of this metal in different forms, such as tacks, rivets, wire rods, telegraph wire, lightning rods, horseshoe nails, pipe strips, plates, sheets, bars, angles, shovels, spades, and stamping iron, which have given great satisfaction to consumers. The metal possesses, according to Captain R. W. Hunt, of Troy, who reported on the subject to the American Institute of Engineers, "an ever-constant welding property with great toughness." He further says: "I obtained steel with 54 per cent of phosphorus, and my surprise certainly did not decrease when I saw the test piece bend double, cold, and the metal work beautifully when hot." As respects the cost, Mr. Witherow, of New Castle, Pennsylvania, who has been associated with Mr. Oliver in the work, presented a paper in which he stated that careful account of expenses while making about 2,000 tons of this steel had been kept, and "including cost of the ferro-manganese, coke, and keeping up the plant, expenses for steam power, labor, and everything connected with the process, it did not exceed $6.50 per ton over the price of the pig iron used." But, as he further showed, much greater economy can be had in a production of the steel blooms in direct connection with the blast furnace.

Another great innovation in steel making processes is announced in England, which, according to the London *Iron and Coal Trades Review*, will put an almost certain end to the malleable iron trade at once, as steel ingots could be made at far less cost than that at which puddled bars are now made. It will be observed that this process appears from the description to be like the one so successfully introduced in Pittsburg, at least in general results, and in probable economy of working.

### Replacing Teeth.

A correspondent writes describing a sled accident by which a ten year old girl had two front upper teeth knocked out.

She was taken to a dentist, who replaced the teeth and strapped up her jaw. For two days she could scarcely speak, no solid food was allowed, but the operation was successful, and the teeth are as firmly set as ever. They are a little chipped, but later on, when it is safe to work on them, they can be patched with gold and be about as good as ever.

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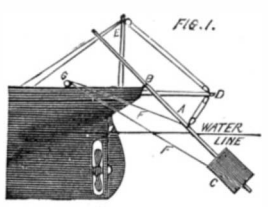
### THE RUDDER OF THE ALASKA.

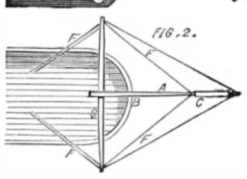
We have received the following additional contributions upon this subject:

*To the Editor of the Scientific American:*

Seeing in your last issue several plans for steering such a steamer as the Alaska, and assuming that she has among her equipments a spar, say fore yard or fore topsail yard, 65 to 75 feet long, and some smaller spars, say 25 feet long, and two of 12 or 14 feet, and a number of hatches about 10 or 12 by 3 or 4 feet, I would try the plan of which I give you a rough illustration.

The important parts of this method obviously are: the arrangement at the taffrail which must permit of movement of the spar, A, so that the part, C, can be lowered and hoisted as well as moved sideways to an angle of 10 or 15 degrees by the guys, F. If means can be found, it would be well to have B made of a clamped iron swivel or universal joint pivoted to the rail; but a wooden chock with an oval hole to permit of the 10 or 15 degrees of movement sideways will answer, if wood enough can be found to construct it of sufficient strength. The bumkin, D, must be a very strong piece of timber, in order to give support to A, and it must have a tackle topping-lift by to support it, and a stout tackle running to the short sheers, E. In order to have spread enough to get a sufficient power on A, and its paddle, C, a spar should be placed across the stern at or near to the point, G.




Sketch 2 shows the stern, the coop spar, G, the guys, F, running to a capstan or worked by what may be termed "relieving tackle," coming inboard at any convenient place on deck. It will be seen at a glance that the effectiveness of this plan depends mainly on the ability to get the paddle, C, sufficiently immersed. My impression is that an angle of about 35 degrees with the water line would be about right.

As the amount of surface in C, or both A and C, would be of timber, it would be necessary to load one or the other; perhaps C, being made of hatches, it may be well to fill in the vacant spaces between the carlines and the planking of the hatches with iron scraps or even coal, or by bolting on some iron plates or pieces of the cast iron floor of the fire room.

It will also be seen that there must be a long spar, and it may be necessary to use a lower yard; if the ship has two square rigged masts, one of them can be stripped to serve the purpose of A and G, as well as D and E, as it may be impossible, on account of having only one square rig mast, to spare the fore yard.

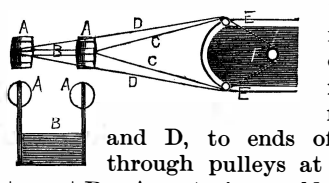
R. B. FORBES.

Milton, Mass., March 23.

*To the Editor of the Scientific American:*

I send you a sketch of a makeshift that I think ought to steer a steamer as well as could be done with a ship in tow, and on the same principle, except that it would be done from her own deck.

Take two or more casks, marked A, and attach to makeshift rudder, B, near edge; weight the other edge nearly as much as the casks will float, attach ropes, C and D, to ends of rudder, and pass D through pulleys at E, and around a capstan at B. Any strain would bring the rudder to an angle with the ship, and retard the side the strain came from. The towlines, C, would take the strain, leaving D very little work to do. If the rudder was sunk say ten feet, the wind would have very little effect in driving it against the ship, if she had to stop, and it would be so light as to do little harm if it did strike. It would also be more stable if deep in the water.



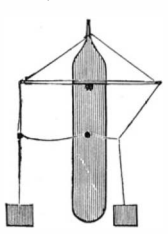

J. W. D.

Newark, N. J.

*To the Editor of the Scientific American:*

Here is the plan of a landsman, who "sniffed the briny" for six months in 1850, trying to get to San Francisco.

Shove a spar out on each side (say abreast of the foremast) about twenty feet, stay from outer end to bow and above to head of foremast, drag of proper size, loaded so as to always be submerged, suspended by cable of sufficient strength from end of each spar, length of cable sufficient to allow drag to be always under water, and, when vessel is in motion, trail about abreast of rudder, but not so long as at any time to come in contact with the propeller; attach line to each cable, start ahead, and if you want to go to port, haul on your starboard line (as in diagram), and thereby shortening distance of starboard drag, permit port drag to haul her head around.



This substitute for a rudder could be made and put in use by a brisk officer and competent crew in an hour after its necessity is felt.

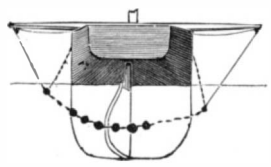
If the company to which the Alaska belongs wish to send me $200,000 for giving them instructions for the care of their property, you can reveal my name to them otherwise I prefer to blush unseen.

S. A.

Cincinnati, O., March 22, 1885.

*To the Editor of the Scientific American:*

I inclose sketch of plan by which I believe the steamship Alaska might have been worked into port with her broken rudder. Briefly, a strong chain long enough to reach well round her stern, with hawser attached, or a continuation of the same chain carried well forward along the sides of ship to the deck. This chain to be tied in knots for several feet of its central section, knots to be far enough apart for space to allow the outside rim of broken rudder to pass between, and knots to be big enough by repeated turns to make considerable projection on chain. This knotted chain to be lowered over her stern from spreader booms with tackle projecting at each side of her stern for a little distance to clear the sides of ship, and held in suspension at proper height to catch the rim of broken rudder rather below the center of curve. Thus, upon drawing in each end of the knotted chain passed along each side of the ship, this knotted section of chain would have been drawn in against the rim of the broken and loose swinging rudder, which would have been pretty sure to pass between some of the knots, and if the chain was drawn taut and pulled round from side to side, the rudder would have to go with it. The swing, of course, would have been limited, but probably enough to have kept the ship in her course. I suppose the chains could have been held taut, and worked by tackle attached to each end and fastened to projections on deck, or perhaps by the hoisting engines.

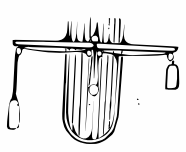


W. F. NILES.

Jersey City, March 23.

*To the Editor of Scientific American.*

Lower the main yard to the deck, lash it to the mast and rail, put four blocks on it, one at each end and two at the mast, then sew up two sacks of canvas, fill them with coal, hang them in the water from each end of the yard, and bring the ropes through the blocks, and then to the steam winch; fix them so that when one sack is lowered the other will rise. A poor remedy certainly, but a quick one.

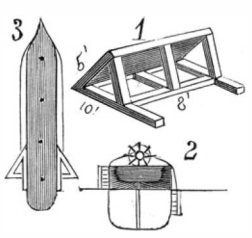


A RIVETER.

Buffalo, N. Y., March 19.

*To the Editor of the Scientific American:*

In the last number of the SCIENTIFIC AMERICAN I see several attempts to solve your question about the broken rudder of the steamer Alaska. I think on such a heavy vessel like the Alaska, in rough weather, it would be impossible to do anything with the old rudder. My plan to bring the vessel under steering control is the following: Build two boxes of angular shape (Fig. 1), angle about 60°; hang one of them on side of the ship at the rear end. The cable on which the device is hung runs across the deck and round a shaft to alternately hoist and lower in and out of the water (as indicated in Fig. 2), according to the course of the vessel, The principle of the device is: The forward motion of the vessel will cause the water to strike against the inclined surfaces of the boxes, and exert a pressure to move the stern sidewise.

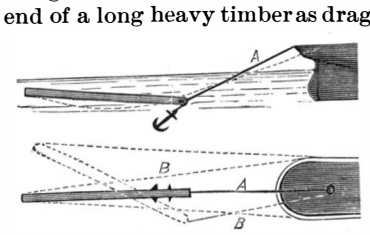



REINHOLD BETTERMANN.

Cambria City, Pa., March 22, 1885.

*To the Editor of the Scientific American.*

If the captain of the Alaska had taken the risk of using one of the anchors with chain, A, fastened to one end of a long heavy timber as drag (as shown on sketch) and two smaller chains, B, one on each side of ship, with ends fastened to stern-end of drag, he would have been able to steer the ship, because the weight would have kept the drag *under* the surface of the water, and the side chains could easily be shortened or lengthened, as shown by dotted lines.




For the sake only of being able to head the heavy sea, let go both anchors with 50 or 60 fathoms of chain and let the ship drift; it will ride the waves nicely. Great Eastern lost her rudder once when on the Atlantic, and a rudder was then invented which proved to work successfully; account of this can be found in some English engineering paper.

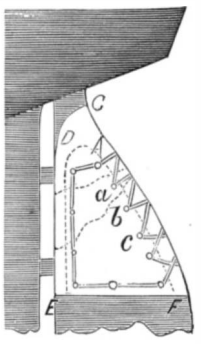
Brooklyn, N. Y., March 19. B.

[The Great Eastern rudder is described in vol. v., 1861, p. 263, of the SCIENTIFIC AMERICAN. She did not lose her rudder; the tiller, or handle, was broken, thereby losing control of the rudder, which was finally made useful by taking a "bight" of chain around the remaining *top* of rudder.—Ed. S. A.]

*To the Editor of the Scientific American:*

In your issue of March 7, you gave sketches showing the broken rudder of the Alaska, and ask for opinions as to what might have been done in the emergency.

Here is something that might have been done, provided the sea was not as rough as to prevent the men from working. Let a piece of heavy plate iron, CDEF, be bent, U-shape, to fit the rudder as nearly as possible. It should begin well up under the counter and run down as far as the water will allow the men to work. At A, and other points, *a*, *b*, *c*, etc., let holes be made in the plating as close to the rim as possible. Let a piece of about ¾" wire rope have the ends passed through A from opposite directions, and drawn taut. It should then be laced through the holes above the ends, in each case being carried across the outer edge of the rudder and passed through from the opposite sides. This method of lowering would make the pull on the rope the same whether the rudder be to starboard or port, and would prevent unlacing. When the lacing had been carried down as far as the water would allow, the rope should be carried across the face of the rudder and laced up the back to keep the plate from spreading. Finally one end should be passed around the outer edge of the rudder above the first turn, thus bringing both ends on the same side, where they could be secured. The plate iron is, of course, on every steamship, and the wire rope could have been taken from the rigging, where it could have been temporarily replaced by hemp rope.




W. S. SMITH.

San Francisco, Cal., March 14.

### Chemistry as a Profession.

Chemists, as a rule, receive from one thousand to twelve hundred dollars a year. This seems small when we consider to what expense a young man has been put to obtain the necessary education. Sometimes, however, in a manufacturing house where he has made himself particularly useful, a chemist may receive eighteen hundred or two thousand dollars, and as superintendent of works he might get five thousand or ten thousand dollars; but such cases are very exceptional. One reason why salaries are smaller in our large cities is said to be found in the number of competent chemists who have come from Germany, and who are willing to work for lower wages than their American brethren demand.

When a chemist has, after years of study and long practice, thoroughly qualified himself in his profession, he can give what is called "an expert opinion." This, as Sam Weller might say, "is an opinion as is much more val'ble than an opinion as is not expert." In a lawsuit, for example, chemists would be employed by both sides, and an expert would receive from fifty dollars a day to twenty-five dollars an hour. If an expert examined a mine, made a report on the formation, and gave his views on the likelihood of its paying the people who intended to purchase it, he would be paid perhaps five or six hundred dollars and all expenses. But, remember, there are very few "experts," and that those who enjoy that reputation have paid the price of long continued study, of hard and enthusiastic labor, for the reputation they have made.—*George J. Manson, in St. Nicholas for April.*

### Surgical Experimenting.

Surgeons frequently find it desirable to remove portions of bone quickly. A small electric motor of high speed was lately tried on a sheep, to exemplify how quickly and neatly it could be done.

A contemporary, in describing the process, says a sheep "was taken, etherized, the bone of his leg was laid bare, and then, by means of an instrument driven by the motor at the rate of 1,200 revolutions per minute, a portion of the bone was bored out, and in a very short time the operation was over—a tiny incandescent light was used for examining the cavity as the work progressed—the wound was dressed, and the sheep was restored to consciousness."

The question will naturally arise in the mind of the reader why the experiment might not as well have been tried on the bone of a dead animal as on a live sheep. What advantage could arise from etherizing and operating upon a poor live sheep, if "the wound was dressed and the sheep restored to consciousness," is beyond our comprehension.

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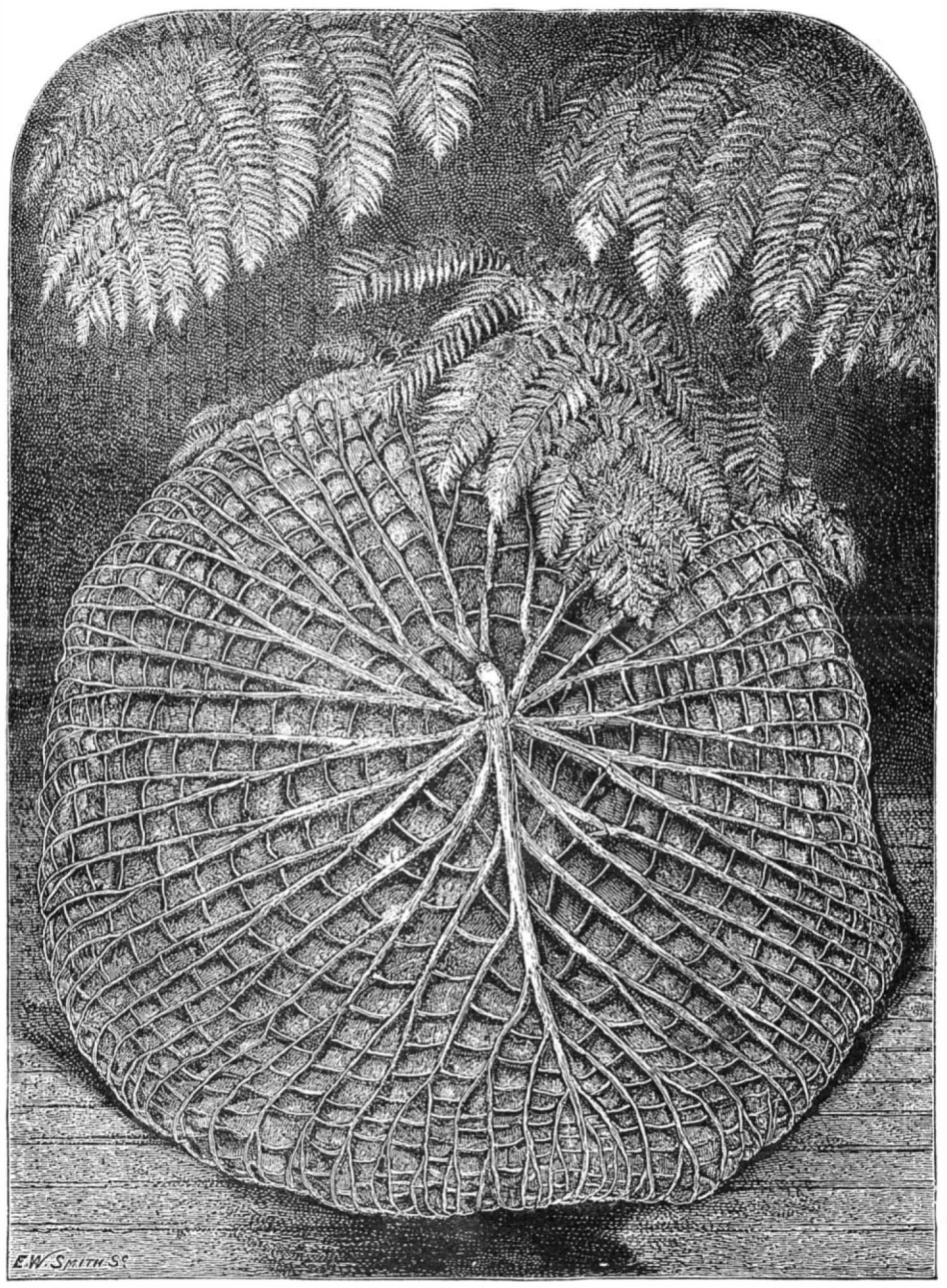
### THE VICTORIA REGIA.

This remarkable water plant is found growing with great luxuriance on the Panama River, and other streams in South America, where it reaches gigantic proportions. Its leaves float upon the surface of the water, are of circular form, in some cases ten feet in diameter, the outer edges turned up, to the extent of from 2 to 6 inches, so as to present the appearance of a great pan. The strength and buoyancy of the leaf are so great as to support on the water the weight of a man. In a properly warmed hot house, the plant may be readily raised from seeds in suitable water tanks, and when thus produced the growth and expansion is a most interesting study. The water is kept at a temperature of from 75° to 80°. The flowers are from 10 to 12 inches in diameter, on first opening white, but soon changing to clear rose pink, delightfully fragrant. Our engraving is from the *Gardeners' Chronicle*, and represents a leaf from some plants that were recently grown with much success at Cherkley Court, England.

Reference to our illustration will serve to give a good idea of the marvelous strength of these leaves when in vigorous condition, as at Cherkley Court. The secret of their great buoyancy is to be found on the under side, where a wonderful provision of nature for sustaining the gigantic leaves, even in troubled waters, is arranged along the entire system of ribs and nerves. Strong cellular structures, as in Euryale ferox, follow every nerve of the leaf, being thickest near the stalk and gradually tapering off to the edge of the blade, acting like continuous cork floats all along the ribs, the greatest sustaining power being placed exactly where most needed—near the leaf stalk—so as the better to counteract or break the force coming from any sudden rise or fall of the water level. Indeed, the whole plant, from the root to the flower, is a study of nature's engineering.




UNDER SURFACE OF LEAF OF VICTORIA REGIA.

### American Pumps for the Soudan.

While some of the best authorities in England express approval of the placing of the order in this country for pumps to be used on the Suakim-Berber route, there are others who seem to find material therein for a good deal of carping criticism. The order was for six duplex Worthington pumps, of a size larger than usually made or ever kept in stock in England, and the subcontractor who had engaged to supply them naturally felt more confidence, where pumps were required to work under a pressure of upward of 1,000 pounds, in thus coming to a firm which had long experience and an established reputation in just this kind of work. Nevertheless, according to the *Ironmonger*, "various makers of pumps have protested against the order being sent to the United States, especially at a time when trade is in such a depressed condition at home," and our contemporary quotes a leading firm as saying "that they could have guaranteed delivery of six duplex pumps, equal in capacity to those purchased in America, within thirty days, at a cost of about £2,000, instead of the £4,000 given to the American firm."

As against this view of the case, however, a statement was made in the House of Commons to the effect that "the duty required of the pumps in question was so great that there was not the slightest chance of any suitable for the work being in stock in England, and many months would be required to make them." The uses to which the pumps are to be put are such as to leave no time for experiment, and any failure to do the work required of them would be disastrous; therefore American pumps have been chosen, although, as it seems, to the mortification of some of the English pump makers.

THE SHARPENING OF TOOLS.—Instead of oil, which thickens and smears the stone, a mixture of glycerine and spirit is recommended. The proportions of the composition vary according to the class of tool to be sharpened. One with a relatively large surface is best sharpened with a clear fluid, three parts of glycerine being mixed with one part of spirit. A graver having a small cutting surface only requires a small pressure on the stone, and in such cases the glycerine should be mixed with only two or three drops of spirit.

### Steel Taking the Place of Wrought Iron.

Few people not actually engaged in the metal trade are aware of the wonderful strides made by steel in recent years. In fact, steel is wholly taking the place of wrought iron. Steel is simply a mixture of iron and carbon, the quantity of carbon ranging from 0·25 to 0·02 per cent of the mass. It is not only stronger and for almost every purpose better than wrought iron, but it is cheaper.

Its first victory over wrought iron was obtained in England, where steel rails for railroads were found to be much better than iron in several ways. They did not wear away so rapidly under the wheels, and they were able to stand a greater strain. The first Bessemer steel plant in this country was started in 1867. Its product was used for making rails; and the total amount for that year was 3,000 tons. For a number of years the Bessemer steel was almost wholly devoted to that purpose, the high price at which it was sold making it unprofitable for other uses to which wrought iron was put. Steel rails brought $160 a ton in 1867. But after the panic of 1873 prices came down, and in 1875 the rails brought $75. The hard times of 1879 lowered the price, in spite of combinations among owners, and in 1883 steel rails sold for $40 a ton. Since that time the price has fallen steadily, and a recent price list puts the price of rails at $29, and of steel slabs, ready to be rolled or forged into any shape, at $28 per ton.

The result of these low prices is that bridges are no longer made of iron. Steel beams have taken the place of iron in the fireproof buildings. Steel ships are built instead of iron ships. Steel boilers replace iron boilers. Steel rifles replace the old cast iron cannon. Wherever tensile strength is required, steel is used.

The use of steel in beams and girders for houses and bridges was a natural sequence of its use in railroad tracks. But the use of this steel has not been confined to railroads and steamships. The big tin plate factories in Wales began to experiment with steel instead of iron about two years ago. Tin plate contains about 93 per cent of iron and 7 of pure tin. The steel plate was found to be cheaper, and the articles made of steel tin plate were superior. For making tin dishes without seams or soldered joints, the Siemens process steel plate is not only superior, but it is about the only kind that can stand the spinning process. This country now imports 240,000 tons of tin plate annually, and it is all made of steel plate with a tin coating.

One field in which steel has not yet wholly displaced iron is in the manufacture of nails. The plates from which nails are cut can be rolled from steel ingots as easily as from puddled iron, but the steel plate is harder to cut, and the cutters charge a little more for the work. The plants engaged in making steel nails are limited in number, and the price of steel nails is higher than that of iron. The steel nail is smoother, stronger, and handsomer, and has made its way in spite of the higher price, but the difference in price is rapidly dwindling, and will, no doubt, soon disappear altogether. In November, 1884, the Wheeling manufacturers charged thirty cents and the Troy men twenty-five cents a keg more for the steel nails. Quotations during the last of February this year were $2.10 per keg for steel nails and $2 for iron. The profit to the manufacturer of the steel nails is much greater on account of the smaller cost of the plates, and the only thing that prevents the iron nail makers from using steel plates entirely is that it takes money to change the plant, and after the great depression of the past two years money is not overabundant among iron manufacturers in any branch of the trade.

A curious outgrowth of this improvement in the manufacture of nails is the action taken by the trades unions in the West at the instigation of the puddlers. By the old puddling process of making iron plates for nails, the pig iron was melted in a grate furnace, and a small army of men stirred up the melted mass with long rods until the impurities were burned out and the iron became pasty instead of liquid. By the new process the melted pig iron in a big pear-shaped kettle is subjected to a powerful blast of air, which is forced up through it from the bottom until the impurities are burned out. Then another small amount of melted pig iron is poured in, and the mixture is ready to be cast into ingots. By the old process, twenty skilled men could turn out fifteen tons of nail plate in a day, while by the new process four common laborers and one skilled mechanic can turn out from 150 to 250 tons in a day. Naturally, the puddlers must lose their occupation. They have induced the Contractors' and Master Carpenters' Association of Wheeling to boycott the steel nails, and all union builders will be asked to boycott them also.

There is one thing that has not yet been successfully made of steel, and that is a propeller shaft for a steamship. Experiments were made in England, and after considerable money had been lost, the attempt was abandoned. Then the wise men who were going to rebuild the American navy took up the abandoned idea, and ordered steel to be used in the shafts for the new cruisers. John Roach objected, but the Advisory Board insisted, and Roach gave the contract to other parties. The Dolphin got her shaft, and started on her trial trip up the Sound, and after a short trip the shaft broke. Then the plans of the other cruisers were altered, and it is said that the change has involved a fatal weakening of the sterns of the new commerce destroyers.—*Sun.*

### Fuel of Large Steamers.

An English contemporary, in replying to a correspondent who asks how many tons of coal a large steamship consumes in a day, quotes the following facts from a pamphlet entitled Bottled Sunshine, issued by T. B. Purnell & Sons, of Exeter: "Ocean steamers are large consumers of coal. The Orient line, with their fleet of ships running to Australia every two weeks, may be mentioned. The steamship Austral went from London to Sydney in thirty-five days, and consumed on the voyage 3,641 tons of coal; her coal bunkers hold 2,750 tons. The steamship Oregon consumes over 330 tons per day on her passage from Liverpool to New York; her bunkers will hold nearly 4,000 tons. The Stirling Castle last year brought home in one cargo 2,200 tons of tea, and consumed 2,800 tons of coal in doing so. Immense stocks of coal are kept at various coaling stations, St. Vincent, Madeira, Port Said, Singapore, and others; the reserve at the latter place is about 20,000 tons. It is remarkable with what rapidity these steamers are coaled; for instance, the Orient steamship last year took in over 1,100 tons at Port Said in five hours."

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## ENGINEERING INVENTIONS.

A car coupling has been patented by Mr. Edward B. Oakley, of Madison, Wis. This invention covers a special construction and arrangement of parts by which cars may be coupled automatically by two hook links, which strike against coupling pins as the cars come together, and on which they catch and are pressed by springs.

An anti-friction material and journal or other bearing has been patented by Mr. Ferdinand E. Canda, of New York city. It is composed of one or more metals or alloys, all solid at ordinary atmospheric temperatures, and ground, granulated, or pulverized, and mixed together with lubricants, such as graphite, mica, soapstone, asbestos, etc., not liable to fuse with the melting of the metals, which mixture may be put up in barrels for use as desired.

A lubricator for steam cylinders has been patented by Mr. Fortunatus G. Kellogg, of Winnipeg, Manitoba, Canada. The body of the lubricator is a tube with ends bent downward, and made with a boss at mid-length on which the cup is screwed, the steam valves acting upon the stems of the lubricant feeding valves, which extend into the steam chamber, to effect a regular and uniform supply of lubricant.

## AGRICULTURAL INVENTIONS.

A plow has been patented by Mr. Ole K. Hamre, of Pennington, Dakota Ter. The essential feature of this invention consists in connections whereby the draught clevis may be swung to either side of a line drawn through the longitudinal center of the plow beam by operating a lever attached to or near the handles or rear end of the plow for shifting the clevis laterally to cause the plowshare to take or leave land or cut a wider or narrower furrow.

A plow point has been patented by Mr. Garland W. Mullin, of Washington, Ga. The purpose of this invention is to obviate the necessity of sharpening the plow point, while making one that is light, inexpensive, and effective; it pertains to that class of plows called "sweeps," used where shallow plowing is required, and the three plates used may be bolted together to make a stiffer plow than one of the same weight would be if made of one thicker plate.

## MISCELLANEOUS INVENTIONS.

A suspended scaffold has been patented by Mr. John Worsley, of Chester, Pa. The object of this invention is to promote convenience and safety in painting the cornices and upper windows of buildings, and it relates to a suspended scaffold made with a ladder having end hooks, and with brackets carrying platform boards, so the scaffold can be readily suspended from the cornice of a building, the horizontal bars of the brackets having sliding bars so the scaffold can be readily widened.

A transparent sign has been patented by Mr. George H. Kitchen, of New York city. This invention relates to signs where glass "bull's eyes" are used for letters placed over a light, and consists in forming the "bull's eye" with a lip or flange of greater diameter than its visible outline, so a shallow cavity can be made therein, and no portion of the ornamental outline of the bull's eye will be obscured by the body portion of the sign, and no dust can collect and remain within the bull's eye.

A thill coupling bolt has been patented by Mr. Ira M. Richardson, of Littleton, N. H., and No. 334 West Seventeenth Street, New York city. This invention consists in the combination, with a bolt, of a spring strip pivoted to one end of the bolt, and having its free end bent up and provided with an aperture for receiving the free end of the bolt, thus locking the bolt in place, the device being such as to prevent the bolt dropping out accidentally, while facilitating its insertion and removal.

A feeding trough has been patented by Mr. James S. Moody, of Fillmore, Ill. The invention covers a swinging hopper, with openings, and a shallow pan or trough, both so arranged as to allow of the feed passing out in limited quantities as the stock by pushing on the hopper cause it to swing, so the stock will get only just as much food as they will eat clean, and the amount of total discharge or time of discharge from the hopper may be regulated.

A folding table has been patented by Mr. John W. Stowell, of Putney, Vt. This invention covers a special construction and combination of parts for the making of a table which, when open for use, will be firm and secure, and will be very compact when folded for storage or transportation.

A wind engine has been patented by Mr. David H. Bausman, of Lancaster, Pa. This invention relates to a former patented invention of the same inventor, and has for its object to provide a machine simple in construction, which regulates itself automatically, and adjusts itself according to the direction from which the wind blows.

A trace carrier has been patented by Mr. James H. Philpott, of Rising City, Neb. This invention covers a cheap and practical device of a trace carrier for harness, in which it is easy to insert and remove the cockeye, and there is a shield to prevent the trace carrier from coming in contact with the horse.

A surveying instrument has been patented by Mr. William L. Curtis, of Forest Grove, Ore. It is a level and sight gauge of novel contrivance, together with a variable angle gauge adapted for use as a surveyor's level, and for determining angles in both vertical and horizontal planes, and for measuring heights and distances, the whole being simple and cheap.

A stone sawing machine has been patented by Mr. R. Lester Barney, of Swanton, Vt. This invention provides, in connection with a suitable base for holding the stone, a tank for receiving sand and water, a bucket chain for raising the sand and water, and a gutter for conducting sand and water that has been dumped to the block of stone being sawed, with various other novel details.

An alarm clock has been patented by Mr. Samuel S. Colt, of Orange, N. J. It is made with a cam wheel connected with the clockworks and operating a bent lever, which is held down by a spring to engage with a stop hook attached to the shaft of the alarm escapement, whereby the alarm will be made to sound intermittently at regular intervals.

A music rack for pianos has been patented by Mr. Charles Baumeister, of New York city. The invention consists in the combination with a piano casing of a rack hinged at its top to the front of the casing, and of a slat adapted to swing downward and outward from the front of the casing and form a support for the bottom of the rack, the rack to be held in place by a latch when closed.

A washboard has been patented by Mr. Henry C. Carter, of Montclair, N. J. This invention relates to washboards fitted with protectors that guard against the splashing of suds on the operator, and also form a bearing surface or rest; it covers a spring connection of the protector with the washboard, and the same protector may be used on either side of the board.

A cloth guide for looms has been patented by Mr. Cornelius J. Sullivan, of Fall River, Mass. This invention consists in guides attached to the breast beam of a loom and arranged in connection with a cloth roller to guide the cloth on to the roller, so as to roll straight and true thereon and prevent the shocks and jars of the loom from causing the cloth to run to one end of the roller.

A corn sheller has been patented by Mr. Nicholas Potter, of Troy, Pa. This invention covers novel features for the promotion of convenience and economy in constructing corn shellers; the ears are introduced through a hopper, the shelled corn escapes through apertures in a grate, and the cobs are forced out by the shelling wheel through an aperture in the upper part of the rear end board.

A fireplace has been patented by Mr. Reuben R. Jones, of Sprague, Washington Ter. It has two separate fire boxes, combined with a series of valves for conducting the products of combustion from one fireplace into the flue of the other, or throwing the heat from one fireplace into the fireplace above the firebox of the other, so that two rooms can be heated by one fire, or one room by two fires.

An overflow alarm for water tanks has been patented by Mr. Frank A. Cushing, of New York city. In combination with the telltale pipe of a water tank is an enlarged section with a wheel journaled in it; there is a pin on the journal of the wheel, a lever hammer, and a gong, all designed to make an improved arrangement for giving notice when a tank is full by ringing a bell.

A gang plank for ferryboats has been patented by Mr. Lawrence F. Frazee, of Jersey City, N. J. The gang plank is hinged on a turning platform, the platform and plank having side rails, and levers being pivoted on the platform and connected by rods with the gang plank, which can be raised and lowered very easily and rapidly, and is so constructed as to prevent the passengers from being forced off the plank.

A sailboat has been patented by Mr. Israel Garrard, of Frontenac, Minn. This invention covers a web device of ballast fin, to use in place of the ordinary center board and ballast, the device being held firmly to the hull of the boat, and having at or near its lower edge such an enlargement as will give sufficient weight to draw the boat down to the desired lines of flotation.

A feeder for cotton presses has been patented by Mr. Henry Selz, of Pilot Point, Texas. The receiving box and feed box are separated by a sliding plate attached to a follower secured to the piston rod of a steam cylinder, to adapt the feeder to be interposed between a cotton gin and a baling press, and the inlet and outlet valves of the cylinder are so connected that the movements of the piston can be readily controlled.

An instantaneous shutter for photographic lenses has been patented by Mr. August Loeffler, of Tompkinsville, N. Y. It is made with a plate having an opening to receive the lens tube, a spring roller and a plain roller connected with the plate, and having a connecting cloth with central opening, with handle, ratchet wheel, and spring lever pawl, whereby the rollers can be readily turned and released, constituting together a simple mechanism for instantly uncovering and covering the lenses, so as to obtain an instantaneous exposure.

A automatic shunt for telephone lines has been patented by Messrs. Charles D. Wright and Charles A. Fisher, of Petersburg, Ill. The invention combines with a telephone line a series of signaling magnets and an electro-magnet and spring for each signaling magnet, the electro-magnets automatically cutting out the signaling magnets when the reverse current does not pass through the electro-magnets, and automatically bringing the several signal magnets in circuit when the signaling current passes through the electric magnets.

## Special.

### TWO WELL KNOWN EDITORS.

One of the busiest religious editors in Philadelphia, as well as one of the most successful, is the Rev. Victor L. Conrad, of the *Lutheran Observer*. He is the office editor, while his brother, the Rev. F. W. Conrad, D.D., is the editor-in-chief. Professor V. L. Conrad gives his whole time and effort to the work of making the *Lutheran Observer* the valuable sheet it is. He was, comparatively, a short time ago, a broken down invalid. Now he is as hearty as anybody need want to be.

In the interest of overworked editors, broken down literary men, and exhausted men of business, one of our writers paid a visit to Professor Conrad a few days ago, and had a pleasant and practical talk with him. Professor Conrad was seated in his editorial chair, "pushing things" for the coming issue of the *Observer*, and thus he informed us:

"There are few people who become as weary and worn as brain workers. By long and unremitting overwork with the brain, I was badly run down, and brought into a condition of great nervous weakness. My stomach was in poor condition. My digestion was bad. If I ate a hearty meal, I felt heavy and dull. I had a general feeling of good-for-nothingness. I was unable to perform my editorial duties with satisfaction. In this state I realized that something must be done, and that right promptly, or I would become a confirmed invalid. This was six or eight years ago.

"From the experience of others, I knew something of Compound Oxygen. I would have been inclined to be a little skeptical about it, but I knew of the case of Mrs. Kelley, formerly Miss Hornbrook. I knew how prostrated she had been; an apparently hopeless case of spinal injury. I thought that if such a case as hers could be reached by Compound Oxygen, mine was not beyond its power.

"To make a long story short, I took the treatment. I saw at once that it was not one of the class of remedies which do their work in twenty-four hours. For this I liked it all the better, and I gained confidence in it. I began to improve; first a little, then more decidedly, but gaining all the time. Before long that miserable feeling of good-for-nothingness was gone. My nerves were toned up. My stomach improved, and eating was no longer the cause of torment. I was able to do my work. My recovery was a simple and pleasant process. No nauseous medicine to take; no unpleasant operations to endure. I could experience the pleasure of restoration and still attend to my literary duties. I continued the treatment until my health was fully restored, and I could perform my editorial labors as felicitously as ever.

"You ask me if I ever have occasion now to return to the treatment. Yes, I do sometimes. There are times when I am mentally jaded from overwork and consequent fatigue. Then I take a few inhalations of the Compound Oxygen, and it seems to renew my vitality and act with immediate effect."

Well, Professor, how about the case of your brother, the Rev. F. W. Conrad, D.D.?

"His restoration by means of Compound Oxygen is a wonderful instance of the efficacy of that method of treatment. His nervous system was completely shattered. His was an aggravated case of overwork, followed by too severe doses of powerful drugs. For several months he was entirely laid aside. After beginning a course of treatment with Compound Oxygen, his improvement soon followed. The first effect was that he was able to enjoy healthy sleep, to which he had long been a stranger. Then his whole system was toned up. His digestion, which had been greatly disordered, became natural and hearty. A marked improvement in his sight was one of the most notable indications. One eye had long been sightless, and the other was weak. But the sight of the remaining eye became much clearer and more reliable. He is now busy among the churches as well as attending to his duties as editor-in-chief of the paper. He travels much of the time, while I attend to the office duties and the detail of the editorial labor. He stands the fatigue of travel wonderfully well. He is preaching almost every Sunday, and delivering frequent addresses.

"Both my brother's case and my own are of interest to the overworked thousands who cannot take a week's rest or a day's rest from their wearying labor. I think literary men, business men, and overworked clergymen as well, ought to know more about this Compound Oxygen; it is so simple, so efficacious, so easy of application, and so certain in cases of disease which the physicians consider almost beyond hope. Its applicability to a wide range of diseases seems to me to be one of its highest merits. It is entirely free from everything like empiricism, and produces the best results by the natural and direct way in which it acts on the vital organs of the system, repairing waste, and making good the ravages of disease and decay."

A "*Treatise on Compound Oxygen*," containing a history of the discovery and mode of action of this remarkable curative agent, and a large record of surprising cures in Consumption, Catarrh, Neuralgia, Bronchitis, Asthma, etc., and a wide range of chronic diseases, will be *sent free* by Drs. Starkey & Palen, 1109 Girard St., Philadelphia, to any one who will write to them for it.

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# Notes & Queries

## HINTS TO CORRESPONDENTS.

**Names and Address** must accompany all letters, or no attention will be paid thereto. This is for our information, and not for publication.

**References** to former articles or answers should give date of paper and page or number of question.

**Inquiries** not answered in reasonable time should be repeated; correspondents will bear in mind that some answers require not a little research, and, though we endeavor to reply to all, either by letter or in this department, each must take his turn.

**Special Information** requests on matters of personal rather than general interest, and requests for **Prompt Answers by Letter,** should be accompanied with remittance of $1 to $5, according to the subject, as we cannot be expected to perform such service without remuneration.

**Scientific American Supplements** referred to may be had at the office. Price 10 cents each.

**Minerals** sent for examination should be distinctly marked or labeled.

(1) G. J. S. writes: I am trying silver plating, that is on a small scale, for the fun of it, and expect to do some for some of my neighbors. Will you kindly inform me what is considered as a good plate, that is, how much silver it takes to put a good coating on an ordinary hunting case watch, enough to last for 4 or 5 years? I mean, would it take one, two, or more ten cent pieces to put on such a coating? Would a gold dollar be enough to plate a watch case with, to last the same length of time (5 or 6 years), or would it require more? Also what acid or acids will dissolve gold, from which I can precipitate gold chloride? A. As much silver as is contained in a dime would give a watch a very good plate. As much gold as is contained in a gold dollar would gild a watch fairly well. The gilding would last for several years if used with care. Dissolve gold in aqua regia, which consists of 1 measure of nitric acid and 3 measures of hydrochloric acid. The salt formed will be terchloride of gold.

(2) D. A. F. asks for information in regard to a good and cheap preparation to put on friction matches. A. The igniting composition varies with different makers. The following recipes may be taken as fairly representative, the first being the best:

| | | |
|---|---|---|
| 1. Phosphorus by weight | ½ | part. |
| Potassium chlorate | 4 | " |
| Glue | 2 | " |
| Whiting | 1 | " |
| Finely powdered glass | 4 | " |
| Water | 11 | " |
| 2. Phosphorus by weight | 2 | parts. |
| Potassium chlorate | 5 | " |
| Glue | 3 | " |
| Red lead | 1½ | " |
| Water | 12 | " |

(3) A. M.—We do not understand your receipt. A German mixture for matches consists of:

| | |
|---|---|
| Potassium chlorate | 7·8 parts. |
| Lead hyposulphite | 2·6 " |
| Gum arabic | 1 " |

(4) A. J. A.—For best preparation to make soap bubbles: Dissolve Castile soap in strong alcohol; let it settle or filter, and take the clear solution, from which evaporate the alcohol. To this add half its weight of glycerine and sufficient water to give the proper consistency.

(5) C. L. asks what to do to cure stammering. A. Stammering in many instances is due to nervousness. Reading aloud every day is said to be of assistance to those afflicted with this complaint.

(6) F. B. P. asks the formula for "Putz pomade," used for cleaning and polishing metals. A. There are a number of formulas given for Putz pomade; the following is one modification:

| | |
|---|---|
| Oxalic acid | 1 part. |
| Iron peroxide | 15 " |
| Powdered rotten stone | 20 " |
| Palm oil | 60 " |
| Petrolatum | 4 " |

Pulverize the oxalic acid and add iron oxide and rotten stone, mixing thoroughly, and sift to remove all grit; then add gradually the palm oil and petrolatum, incorporating thoroughly. Add oil of myrbane or oil of lavender to suit. Apply with a piece of flannel, rubbing off with a piece of soft paper, and polish with chamois.

(7) J. C. T. asks what distance a vessel of 500 tons displacement would recoil were a projectile of 6 inches diameter or 28 inches area fired therefrom under water, say 4 feet deep, with a pressure of 4,500 pounds per square inch. A. There would probably be no perceptible recoil of the vessel. Its sides being elastic and the vessel hollow, the vessel would simply vibrate or tremble.

(8) S. L. L.—The restoration of an ink depends largely upon the variety of ink used. In the case of iron inks, exposure to the vapor of hydrogen sulphide of the moistened paper is sometimes sufficient. Potassium ferrocyanide will develop the ink in blue if iron was originally in the ink. See also page 2131 of SCIENTIFIC AMERICAN SUPPLEMENT, No. 134.

(9) J. J. A. asks how many miles he can make per hour with a small steamer 20 feet long by 4½ wide, engine 2½ by 3½, pressure steam 90 pounds. A. 4 to 5 miles.

(10) J. S. P. writes: Some business men of this city wish me to write you for information as to when the process of galvanizing iron was first known, they having found some galvanized iron pipe; several feet below the cellar of an old building which has not been disturbed for over forty years. A. The process of coating iron with zinc, or zinc and tin, is a French invention, and was patented in England in 1837.

(11) F. M. K.—Steam flows into a vacuum at the atmospheric pressure with a velocity of 1,550 feet per second. At 10 atmospheres pressure the velocity is only about 1,780 feet. You may readily interpolate for intermediate pressures.

(12) G. D. C. asks what metal is used for types, and what kind of moulds. A. Type metal: 3 parts lead, 1 part antimony, by weight. Plaster of Paris makes good moulds for type metal.

(13) W. S. P. asks how to give the flavor of maple sugar to a solution of cane sugar. A. Only by the admixture of maple sirup with the cane juice. The proportions must be determined by experiment.

(14) J. J. D.—Kerosene can be colored by means of aniline dyes. Many of these will dissolve directly in the kerosene. By using those soluble in alcohol, and dissolving them in this solvent and then mixing with the kerosene, the desired result will undoubtedly be accomplished.

(15) J. H. L. says: I have a simply geared circular saw that one horse works with difficulty. If I should increase the number of revolutions of the same saw one-half, using the same pulley, and force the wood against the saw at the same speed, would the work be easier on the horse? A. The increase of the work of the horse is more than the percentage of speed, much of the power being absorbed by the machinery of transmission, which we have no knowledge of.

(16) F. I. S. asks how to oxidize copper or brass. A. Immerse the articles in a solution of 2 ounces nitrate of iron and 2 ounces hyposulphite of soda to 1 pint of water, until the desired shade of oxidation is acquired, then wash, dry, and brush.

(17) O. H. H. asks: By what process is beeswax refined and made nice and yellow. A. Pure white wax is obtained from the ordinary beeswax by exposure to the influence of the sun and weather. The wax is sliced into thin flakes and laid on sacking or coarse cloth, stretched on frames, resting on posts to raise them from the ground. The wax is turned over frequently, and occasionally sprinkled with soft water if there be not dew and rain sufficient to moisten it. The wax should be bleached in about four weeks. If on breaking the flakes the wax still appears yellow inside, it is necessary to melt it again, and flake and expose it a second time or even oftener, before it becomes thoroughly bleached, the time required being mainly dependent upon the weather. There is a preliminary process, by which, it is claimed, much time is saved in the subsequent bleaching; this consists in passing melted wax and steam through long pipes, so as to expose the wax as much as possible to the action of the steam; thence into a pan heated by a steam bath, where it is stirred thoroughly with water and then allowed to settle. The whole operation is repeated a second and third time, and the wax is then in condition to be more readily bleached.

(18) C. F. S.—Your belt will transmit from 10 to 15 horse power, according to its tension. The determination of power used is very uncertain by belt alone. The only approximate way is to use a belt of a width that will just drive the machine without slipping and compute its value. See SCIENTIFIC AMERICAN SUPPLEMENT, Nos. 39 and 331, for tables and formulas for obtaining horse power of belts.

(19) O. O. writes: I wish to enamel cast iron pieces, partly hollow, which are not to be exposed to heat. How can I do it in a cheap way? A. Use white Japan varnish; bakes at about 250°, is hard and durable, same as used for registers; can be obtained from the varnish makers.

(20) J. E. W. sends us the flowering glumes of a grass that he wishes to know the name and value of. A. The glumes sent are those of the "wild oat," a grass very common in California. To botanists it is known as *Avena fatua.* It is considered a great injury to any grain field into which it may be introduced, but it makes a very good quality of fodder, and is sometimes employed for that purpose in California. We would not advise its cultivation, as it spreads very rapidly, and eventually becomes a very great pest.

# INDEX OF INVENTIONS

**For which Letters Patent of the United States were Granted,**

**March 17, 1885,**

**AND EACH BEARING THAT DATE.**

[See note at end of list about copies of these patents.]

Anchor, J. A. Pettes ..... 314,149
Animal trap, J. Schaffer ..... 313,957
Anti-frictional material and journal or other bearing, F. E. Canda ..... 313,916
Assembling bolt, J. G. Staunton ..... 314,075
Bag holder, G. W. Wentz ..... 313,902
Basket, R. S. Bartlett ..... 313,910
Basket cover, fruit, J. W. Leslie ..... 313,873
Bathing garment, S. Ashner ..... 313,845
Bed, mantel, J. H. Laskey ..... 314,032
Bell, electric, C. E. Kells, Jr ..... 313,941
Belt lace, N. I. Allen ..... 313,974
Belt shifting and replacing device, P. Diehl ..... 313,999
Bench dog, M. J. Kugler ..... 313,943
Bench hook, J. B. Sargent ..... 314,058
Bicycle saddle, T. J. Kirkpatrick ..... 314,142
Binder, newspaper, G. W. Welch ..... 314,159
Bit. See Horse bit.
Bit brace, J. T. Pendersen ..... 313,950
Blast furnaces, hoisting and top filling apparatus for, F. Brown ..... 313,849
Blind slat fastening, E. M. Coffin ..... 313,919
Blind tenon, J. Forhan ..... 313,859
Board. See Bosom board. Vehicle dash board.
Boat. See Tow boat.
Boiler. See Steam boiler. Vegetable boiler.
Boiler furnace, steam, M. Coryell ..... 313,992
Bolt. See Assembling bolt. Lock bolt.
Bolting reel attachment, F. Burckhardt ..... 313,988
Bookbinding heading, W. Macdonald ..... 313,875
Book support, I. L. Hyde ..... 314,151
Boring machine, gang bit, E. B. Hayes ..... 314,124
Bosom board, F. M. Wright ..... 314,211
Bottle stopper, W. H. Clarke ..... 314,110
Bottle stopper, F. J. Deverall ..... 313,926
Bottle stopper, L. S. Hoyt ..... 314,025, 314,179
Box fastener, S. B. Dunn ..... 313,857
Brace. See Brace bit.
Bracket, W. S. How ..... 313,937
Braiding machine, H. W. Winans ..... 313,905
Brake. See Locomotive brake.
Brick, W. Heard ..... 314,022
Brick for veneering frame houses and other wooden buildings, M. F. Ellis ..... 313,920
Brine cooling apparatus, C. G. Mayer ..... 314,038
Buckle, C. R. Harris ..... 314,018
Buggy, side bar, R. St. Clair ..... 314,077
Bung cutter, H. Waas ..... 314,086
Button and disk trimming machine, S. L. Otis ..... 313,949
Button attaching apparatus, A. G. Wilkins ..... 314,092
Button shank or eye testing machine, E. R. Parsil ..... 314,052
Calendar, J. Cussons ..... 313,996
Canning apparatus, fruit, W. H. Austin ..... 313,975
Cans, testing sealed, M. C. Hutchings ..... 314,180
Car, combined grain and oil, J. R. Gathright ..... 313,932
Car coupling, U. Beausejour ..... 313,977
Car coupling, F. Burckhardt ..... 313,983
Car coupling, W. F. Julian ..... 313,871
Car coupling, W. S. Miner ..... 314,045
Car coupling, E. B. Oakley ..... 314,049
Car coupling, W. Turnbull ..... 313,968
Car floor, F. Burckhardt ..... 313,986
Car roof, F. Burckhardt ..... 313,985
Car wheel, self-oiling, H. L. Kirchman ..... 314,140
Cars, steam heating apparatus for railway, J. Emerson ..... 314,006
Cars, steam valve connection for railway, J. Emerson ..... 314,007
Carpet fastener, J. Pearsall ..... 314,053
Carriage step, F. A. Sawyer ..... 314,151
Cartridges for ordnance, Hope & Ripley ..... 314,127
Case. See Ticket case.
Casting, making metallic suspension wheels by, A. O. Frick ..... 314,173
Chair. See Nursery chair.
Check rower wire, machine for forming, G. W. Caywood ..... 314,106
Checking and registering baggage, L. G. Reynolds ..... 314,215
Chicken cholera, remedy for, G. W. & J. D. Ross ..... 313,956
China and earthenware, etc., ornamenting, Doulton & Slater ..... 314,002
Chisel, lock mortising, P. L. Fox ..... 314,011
Chopper. See Cotton chopper.
Churn, A. Robinson ..... 313,886
Churn, J. P. Spilger ..... 314,073
Cigar perforator, L. C. Michelena ..... 314,043
Clasp. See Shoe clasp.
Clinometer, J. Kindleberger ..... 313,872
Clock, pneumatic, Hahl & Mergenthaler ..... 314,014
Clothes pounder, R. M. Rimer ..... 313,955
Collar sweat pad, horse, J. Straus ..... 313,963
Cooking utensil, N. E. Robinson ..... 314,057
Copying machine, S. Wheeler ..... 314,091
Corn hulling mill, C. S. Day ..... 313,997
Cotton chopper, H. G. Cady ..... 314,104
Coupling. See Car coupling. Hose coupling. Shaft coupling.
Crank pin lubricator, F. F. Swain ..... 313,964
Cultivator, J. P. Black ..... 313,847
Cultivator, Kemper & Stumpe ..... 314,136
Cultivator, J. Lane ..... 314,143
Cultivator, G. W. Wilson ..... 314,094
Cup. See Grease cup.
Cutter. See Bung cutter.
Cutting oats, etc., machine for, F. Burckhardt ..... 313,987
Damper for stovepipes and flues, F. J. Gilman ..... 314,121
Derrick, O. E. Halin ..... 314,015
Die or nipple holder, S. J. Wakeley ..... 314,087
Door hanger, G. W. Hey ..... 314,177
Door, hanging, G. W. Emerson ..... 314,005
Doors and shutters, bar for securing, C. H. Knauer ..... 313,942
Doubling and winding yarn or thread upon bobbins, machine for, J. & J. Horrocks ..... 313,869
Drill. See Rock drill.
Drilling and tapping apparatus, J. Van Norman ..... 314,085
Electric machine and electric motor, dynamo, A. Reckenzaun ..... 313,884
Electric machines, armature for dynamo, W. Stanley, Jr ..... 313,894
Electric lights, protecting incandescent, N. S. White ..... 314,208
Elevator, G. H. Roehm ..... 313,887
Elevators, electrical safety device for, R. M. Curtiss ..... 314,167
End gate fastener, B. J. Swenson ..... 314,154
Engine. See Gas engine. Road engine. Rose engine. Steam engine. Traction engine.
Escapement, G. B. St. John ..... 313,962
Extractor. See Staple extractor.
Fabric turfing implement, C. M. Hinkle ..... 314,023
Feed water heater, W. Schwartz ..... 313,890
Feed water trap, steam, H. Creamer ..... 313,854
Feeder, steam boiler, C. A. Rickard ..... 313,954
Felly inserting device, J. G. Roh ..... 314,197
Fence, W. H. Boggs ..... 313,848
Fence, N. Knaub ..... 314,184
Fence wire, barbed, W. Edenborn ..... 313,929
Fencing, making barbed metallic, E. Jordan ..... 314,183
Fifth wheel, vehicle, T. Smith ..... 314,068
Filter, R. C. Moore ..... 313,946
Filter, H. Roeske ..... 314,150
Firearm magazine, R. F. Cook ..... 313,851
Firearm magazine, L. P. Diss ..... 313,856
Fire extinguishing hand grenades, hermetical seal for liquid, J. H. Peirce ..... 314,148
Flanging machine, R. A. Carter ..... 313,917, 313,918
Flour bolt attachment, J. M. R. Kennedy ..... 314,137
Fork. See Hay fork. Hay and manure fork.
Fruit jar, J. G. Briggs ..... 314,099
Fuel, artificial, H. Aigner ..... 314,097
Furnace. See Boiler furnace. Tire heating furnace.
Furnace, Kearney & Hawley ..... 313,939
Gas burner safety attachment, F. Dittmar ..... 314,000
Gas cooling apparatus, C. G. Mayer ..... 314,039
Gas engine, G. Daimler ..... 313,922, 313,923
Gas lighter, electric, J. Geary ..... 314,119
Gas lighter, electric, C. W. Weiss ..... 314,088
Gas pressure regulator, J. D. Averell ..... 313,846
Gas purifying apparatus, A. O. Granger ..... 313,861
Gases, apparatus for regulating or controlling from a distance the flow of, Muratori & Cros ..... 314,188
Gases or fluids under pressure, regulator for, J. S. Hazard ..... 314,020
Gate. See Swinging gate.
Gate, R. I. Davis ..... 313,855
Generator. See Hot air generator. Steam generator.
Glass pendants, manufacture of, W. Somerville ..... 314,069
Gloves, garters, etc., fastening device for, E. Griswold ..... 314,174
Grain binder, R. Brown ..... 314,102
Grain binders, cord holder for, N. T. Remy ..... 314,056
Grain cleaner, D. Best ..... 313,911
Grain cleaning machine, J. D. & H. Hasselbusch ..... 314,123
Grain huller, F. Burckhardt ..... 313,984, 313,989
Grate, H. C. Williamson ..... 313,904
Grates, shaking attachment for, R. S. T. Cissel ..... 314,108
Grease cup, W. Schoendelen ..... 314,062
Grindstone apparatus, J. I. Mettler ..... 313,877
Gypsum, stucco, or the like, manufacture and preservation of articles of, M. Dennstedt ..... 314,114
Hair crimper, E. J. Brooks ..... 314,100
Hame, N. G. Schwalen ..... 314,063
Hame fastener, C. K. Dickson ..... 313,927
Hanger. See Door hanger.
Harness for horses, J. W. Conradt ..... 313,850
Harvester, grain binding, J. Miller ..... 313,878
Harvesters and mowers, cutter and cutter guard for, R. Brown ..... 314,103
Hasp lock, C. Neblett ..... 314,147
Hat brims, apparatus for curling and setting, L. H. Hoyt ..... 314,131
Hat ventilator, M. J. Nascimento ..... 314,048
Hay and manure fork, horse, W. Taylor ..... 313,966
Hay during the process of baling, device for removing dust, etc., from, J. S. Sherman ..... 313,960
Hay fork, horse, S. Miller ..... 313,044
Heater. See Feed water heater.
Hinge lock for shutters, S. M. Carnes ..... 314,105
Hoe, R. J. Whitehurst ..... 313,972
Hoisting and conveying machines, automatic dump bucket for, A. E. Brown ..... 314,101
Hoisting apparatus, coal, D. C. Niblick ..... 313,880
Hoisting bucket, L. G. Ladd ..... 314,031
Holder. See Bag holder. Lamp holder.
Hominy, grits, etc., manufacturing, F. Burckhardt ..... 313,982
Hook, J. Davis ..... 314,168
Hop scales from their stems, machine for separating, J. Muller ..... 314,146
Hop strings, securing, O. Shute ..... 314,198
Horse bit, A. Thornton ..... 314,081
Horses, vehicle device for checking, E. B. Taylor ..... 313,897
Hose coupling, H. C. Sergeant ..... 314,066
Hot air generator for fireplaces, J. S. Deardorff ..... 313,998
Hub, vehicle wheel, J. C. Hollingsworth ..... 314,024
Huller. See Grain huller.
Ice creeper, J. J. Temple ..... 313,898
Ice cutting machine, I. Crowfoot ..... 313,995
Ice tongs, W. Dimond ..... 314,169
Illuminating basements, P. H. Jackson ..... 314,026
Indicator. See Station indicator.
Jack. See Lifting jack. Screw jack.
Jar. See Fruit jar.
Jar or other covered vessel, W. H. Clarke ..... 314,109
Journal bearing, Thayer & Howell ..... 314,079
Key ring attachment, A. O. Jones ..... 314,028
Ladder, step, D. A. Foster ..... 314,118
Lamp burner, T. Hipwell ..... 314,178
Lamp fixture, G. C. Thomas ..... 314,080
Lamp holder, incandescent electric, A. Swan ..... 313,965
Lamp, oil, W. P. Butler ..... 314,165
Lifting jack, A. H. Handlan, Jr ..... 313,935
Line fastener, automatic, S. & F. Seib ..... 314,065
Line ring for hames, G. J. Letchworth ..... 314,034
Liquid meter, H. F. Gaskill ..... 313,860
Lock. See Hinge lock. Revolver lock.
Lock bolt for doors, J. B. Schroder ..... 313,888
Locomotive brake, J. H. Williams ..... 314,209
Locomotive friction device, N. S. Shaler ..... 313,959
Lubricator. See Crank pin lubricator. Steam cylinder lubricator. Steam engine lubricator.
Lubricator, F. Renders ..... 313,951
Magnet, electro, E. D. McCracken ..... 314,041
Mat. See Picture mat.
Medicine, dyspepsia remedy, J. E. Wright ..... 314,212
Metal bending machine, A. Urbahn ..... 313,969
Metal drilling tool, T. Scheffler ..... 314,059
Metals, purifying, C. Edwards ..... 314,004
Meter. See Liquid meter.
Mill. See Corn hulling mill. Rolling mill.
Monument, A. Harroun ..... 314,019
Mortising machine, chain, T. E. Daniels ..... 313,924
Mowing machine, W. A. Knowlton ..... 314,186
Musical instrument, mechanical, M. Gally ..... 314,012
Nursery chair, B. C. Odell ..... 313,881
Nut lock, W. S. Clymer ..... 314,112
Nut lock, C. A. Pennington ..... 314,194
Oil vapors, apparatus for separating, J. E. Bicknell ..... 313,979
Oven for continuous working, baking or cooking, W. Lorenz ..... 314,144
Overalls and pantaloons, Goldstein & Rombach ..... 314,122
Ores for smelting, preparing iron, M. R. Conley ..... 314,113
Ox shoes, die for forging, W. Pearce ..... 314,189, 314,193
Ox shoes, forging, W. Pearce ..... 314,190 to 314,192
Packing ring for pistons, pump buckets, etc., metallic, W. Buckley ..... 313,980
Pad. See Collar sweat pad.
Pail, T. A. Cook ..... 313,990
Paper cutter, mechanism for laying off sheets from a, Harlow & Parker ..... 313,864
Papermaker's cotton drying felt, printer's machine blanket, etc., J. Crossley ..... 313,994
Paper pulp fabric for boxes, etc., Pease & Babson ..... 314,054
Piano action, upright, F. Polster ..... 314,195
Picks, machine for making, S. T. Tyler ..... 313,900
Picture mat, A. S. Fontaine ..... 314,008
Pipes, automatic stop plug for gas and oil, W. F. Cosgrove ..... 313,993
Planer presser roll, S. M. Richardson ..... 313,885
Planter and fertilizer distributer, seed, J. P. Lummus ..... 314,187
Planter and harrow, combined seed, M. Kirkpatrick ..... 314,141
Planter, corn, L. Scofield ..... 313,891
Planter, cotton seed, J. M. Howell ..... 313,938
Plow, O. K. Hamre ..... 314,017
Plow stock, double foot, D. O. Page ..... 314,050
Plow, wheel, G. Moore ..... 313,947
Power transmitting device, J. Ward ..... 314,207
Press. See Printing press.
Press, J. H. Bock ..... 313,914
Printing press, C. B. Cottrell ..... 314,166
Printing press card feeding attachment, S. A. Spencer ..... 314,203
Propelling vessels by exhaust steam, C. E. Burch ..... 313,981
Pulverizer, O. S. Richmond ..... 313,953
Pump, D. P. Stewart ..... 314,078
Pump, double-acting, submerged, C. H. Foster ..... 314,117
Pump, force, A. F. Nagle ..... 313,879
Pumping engine, direct-acting, W. H. Worthen ..... 314,161
Pumping oil well, apparatus for, G. Allen ..... 313,907
Punch, S. Coons ..... 313,991
Radiator, W. Hopkins ..... 314,128
Radiator, steam, L. H. Prentice ..... 313,883
Radiator valve, J. A. Scollay ..... 313,892
Railway, mine, J. C. Fowle *et al.* ..... 314,010
Railway signal, A. Hoffmann ..... 313,936
Railway signal, apparatus for actuating the lever of a, A. H. Stetson ..... 313,895
Railway sleepers, treating, J. B. Blythe ..... 313,912
Railway structure, underground, R. R. Hazard ..... 314,021
Railway switch, J. W. Henderson ..... 313,866
Railway switch, automatic, C. S. Drake ..... 313,928
Railway tie, C. M. Van Orman ..... 314,158

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Railway track to be used in connection with variable railway trucks, G. W. Bemis, Sr. ..... 313,978
Railway tracks and gas pipe lines, system for the protection of, G. Westinghouse, Jr. ..... 314,089
Railways, pneumatic block signal for, W. H. Schmelz ..... 314,060
Rake and pitchfork, combined, A. Alderman ..... 313,843
Rattan scraping machine, A. McDonald ..... 314,042
Refrigerator door, G. A. McArthur ..... 313,876
Refrigerator water cooling attachment, J. E. Guenther ..... 314,175
Register. See Time check register.
Regulator. See Gas pressure regulator. Temperature regulator.
Respirator, M. Souvielle ..... 314,070
Revolver lock, J. T. Smith ..... 314,067
Ring. See Line ring.
Road engine, A. O. Frick ..... 314,172
Rock drill, G. F. Wynne ..... 314,213
Rock drill tripod, G. M. Githens (r) ..... 10,572
Rolling mill, F. H. Treat ..... 314,083
Rolling mill for rolling leafed wire for the manufacture of barbed wire, F. H. Treat ..... 314,082
Roof, J. G. Staunton ..... 314,076
Roof, fireproof composite, T. H. White ..... 313,971
Roofing finishing, L. D. Cortright ..... 313,852
Roofing for buildings, L. D. Cortright ..... 313,853
Rose engine, A. Schwitter ..... 314,064
Rowing apparatus, B. Dorscher ..... 314,061
Sash fastener, J. Ashton ..... 314,162
Sash supporter, J. D. Simmons ..... 314,201
Saw, drag, F. A. Strong ..... 314,152
Saw jointer, G. H. Mayer ..... 314,040
Sawmill dog, W. H. Snyder ..... 314,071
Scarfs. retainer for the bands of neck, W. B. Clement ..... 314,111
Scraper and excavator, road, C. M. Jones ..... 314,135
Screen and storm door, combined, C. Anderson ..... 313,844
Screw jack, A. R. Tiffany ..... 313,967
Seal, baggage, E. J. Brooks ..... 314,164
Seal lock for car doors, J. Forbes ..... 314,009
Sewing machine, A. Watkins ..... 313,970
Sewing machine buttonhole attachment, G. Rehfuss ..... 314,055
Sewing machine buttonhole cutting attachment, E. B. Moore ..... 314,046
Sewing machine feeding device, E. McDonald ..... 313,945
Sewing machine presser feet, vertically reciprocating, J. C. Goodwin ..... 313,933
Sewing machine table cover, G. A. Annett ..... 313,908
Shaft coupling, W. B. Turner ..... 314,206
Shell, dynamite, J. F. Marvin ..... 314,036
Shirts, combined re-enforce and stay for the backs of, J. M. Ide ..... 313,870
Shoe clasp, J. J. Unbehend (r) ..... 10,573
Shoe heel, J. Howland ..... 314,130
Siding gauge, J. H. Jenkins ..... 314,133
Signal. See Railway signal.
Sled propeller, J. Wissen ..... 314,210
Speculum, rectal, L. J. Ingersoll ..... 314,132
Spinning frame stop motion, L. L. Sweatt ..... 314,153
Sponge gathering net, B. K. Moscopoulos ..... 314,047
Spring. See Vehicle spring. Vehicle seat spring. Wagon bolster spring.
Staple extractor, T. Flanagan ..... 314,116
Staple fastener for wooden vessels, W. O. Swett ..... 314,204
Station indicator, railway, J. Matzinger ..... 314,037
Stave dressing machine, J. B. Heverling ..... 314,125, 314,176
Steam boiler, J. M. McCulloch ..... 313,944
Steam cylinder lubricator, F. G. Kellogg ..... 314,030
Steam engine, S. L. Guess ..... 313,862
Steam engine, S. H. Howard ..... 314,129
Steam engine lubricator, W. H. Craig ..... 314,214
Steam generator, N. W. Pratt ..... 314,196
Steam pipe fittings, non-conducting covering for, S. Seymour ..... 313,958
Steering apparatus, automatic, C. H. Washburn ..... 313,901
Stereoscope, reflecting, A. K. Tuttle ..... 313,899
Stitch forming mechanism, apparatus for guiding, straightening, and evening fabrics for presentation to, S. Arnold ..... 313,909
Stove, S. A. H. Williamson ..... 314,093
Stove and range oven, cooking, D. G. Littlefield ..... 313,874
Stove or heater, T. J. Trew ..... 314,205
Stovepipe elbow, Evans & Bissett ..... 313,858
Stove shelf, T. Kehoe ..... 313,940
Stove, vapor, Z. Davis ..... 313,925
Stoves, fire bricks, etc., compound for repairing, Ivett & George ..... 314,182
Stopper. See Bottle stopper.
Suspenders and shoulder braces, combined, E. D. Parrott ..... 314,051
Swinging gate, Bartholomew & Abbott ..... 313,976
Tag and fastener, S. E. Mower ..... 313,948
Tank, E. Hines ..... 313,867
Tanning apparatus, L. Simpson ..... 314,199, 314,200
Telegraph, chemical stock quotation, Edison & Kenny ..... 314,115
Telephone receiver, T. F. Taylor ..... 314,155 to 314,157
Temperature regulator, thermo-pneumatic, W. S. Johnson ..... 314,027
Ticket case, Weston & Prockter ..... 314,090
Ticket, continuous mileage, J. Eastman ..... 314,170
Timber, apparatus for treating, seasoning, and preserving, J. B. Blythe ..... 313,913
Time check register, F. W. Griswold ..... 313,934
Tire heating furnace, Smith & Schad ..... 314,202
Tobacco machine, plug, Wildey & Rollins ..... 313,903
Tongue support, wagon, W. R. Spray ..... 314,074
Torch, night signal, C. T. Lee ..... 314,033
Tow boat for canals, D. W. Cooke ..... 313,920
Toy, V. E. Riches ..... 313,952
Traction engine, W. H. Snyder ..... 314,072
Trap. See Animal trap. Feed water trap. Vermin trap.
Tricycle, C. F. Hadley ..... 313,863
Triturator, L. H. White ..... 313,906
Type writing machine, G. W. N. Yost ..... 313,973
Type writing machines, inking ribbon alarm for, A. O. Hall ..... 314,016
Valve, check, W. Chappell ..... 314,107
Valve lever, throttle, A. M. Stickney ..... 313,896
Valve movement for direct-acting engines, W. D. Hooker ..... 313,868
Valve rod connection, J. B. Stanwood ..... 313,961
Valve, slide, C. M. Giddings ..... 314,120
Vegetable boiler and cutter, C. Unger ..... 314,084
Vehicle dash board, K. J. Schuster ..... 313,889
Vehicle seat spring, King & Stivers ..... 314,138
Vehicle spring, J. J. Kalina ..... 314,029
Velocipede, C. L. Work ..... 314,160
Velocipede treadle motion, G. H. Griffiths ..... 314,013
Ventilating louver, G. Hayes ..... 313,865
Ventilator. See Hat ventilator.
Vermin trap, E. J. Jarvis ..... 314,133
Wagon bolster spring, King & Stivers ..... 314,139
Wagon top, H. W. Blood ..... 314,098
Washing machine, Blakemore & Roberts ..... 314,163
Water closet, J. Muirhead ..... 314,145
Water elevator bucket, windlass, C. W. Schmueser ..... 314,061
Water meter, rotary, F. A. Hinds ..... 314,126
Water, purifying, T. W. Duffy ..... 314,003
Water wheel, turbine, W. H. Elmer ..... 314,171
Weather strip, J. Cotrell ..... 313,921
Well point, drive, J. E. Parker ..... 313,882
Well, tube, F. H. Smith ..... 313,893
Wells, tubing and packing artesian and oil, J. Bole ..... 313,915
Wheel. See Car wheel. Fifth wheel. Water wheel.
Wheel, J. Frenier ..... 313,931
Wheelbarrow, H. W. Knowlton ..... 314,185
Wheelbarrow, J. W. Marshall ..... 314,035
Whisky, making, F. M. Young ..... 314,096
Wrench, T. J. Wilson ..... 314,095

## TRADE MARKS.

Butter, J. Thallon ..... 12,028
Clothing, oiled, Adler Bros. & Co ..... 12,015
Dress shields, Canfield Rubber Company ..... 12,018
Extract taraxicum, olive oil, tincture of laudanum, and insect powders, fluid, Weismann & Muellenbach ..... 12,030
Flour, wheat, H. A. Hayden ..... 12,021
Hair dye, M. L. Kellogg ..... 12,023
Medicine for certain named diseases, to be used externally and internally, C. A. M. Pulliam ..... 12,026
Medicine for cholera, diarrhœa, colic, and like diseases, C. R. Harrington ..... 12,019
Paper bags, Western Paper Bag Company ..... 12,031
Saddle blankets, fly nets, horse sheets, lap robes, and lap dusters, W. Ayres & Sons ..... 12,016
Silica cleaning and polishing preparations, Plymouth Silica Company ..... 12,025
Tobacco, plug, Bostic Bros. & Wright ..... 12,017
Valves and hydrants, Chapman Valve Manufacturing Company ..... 12,029
Varnishes of all kinds, J. A. Shephard ..... 12,027
Vehicles for carrying passengers, wheeled, P. Herdic ..... 12,022
Washes, white or colored, for use on walls, fences, etc., A. A. Hasson ..... 12,020
Washing liquid, L. Kuhlmann & Bro ..... 12,024

## DESIGNS.

Bluing strainer, J. C. Nobles ..... 15,979
Carpet, E. D. Chandler ..... 15,967
Carpet, J. L. Folsom ..... 15,968 to 15,971
Carpet, O. Heinigke ..... 15,973 to 15,975
Carpet, W. McCallum ..... 15,977, 15,978
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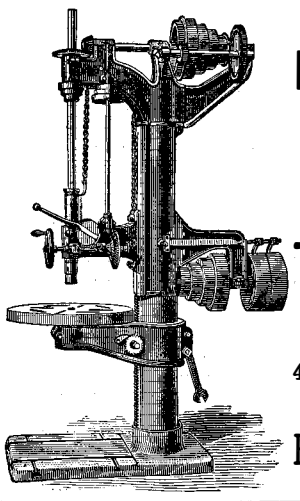

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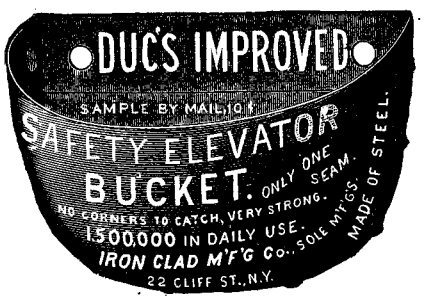


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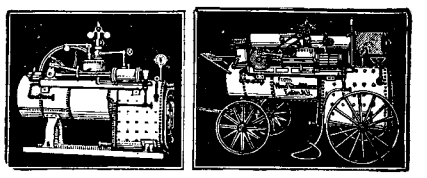

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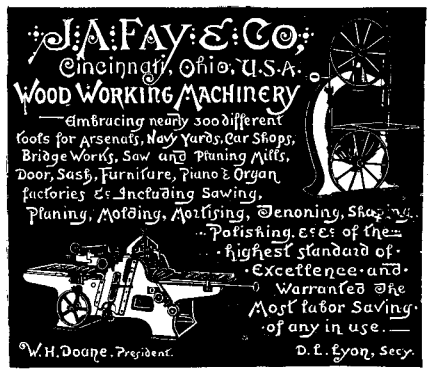
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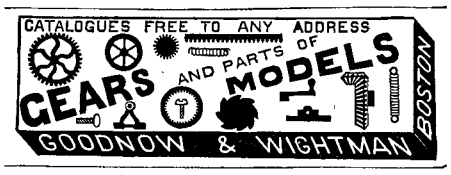


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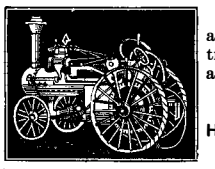

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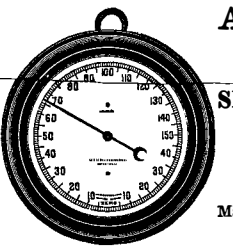

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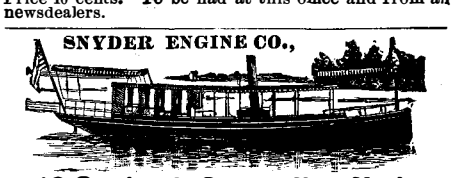

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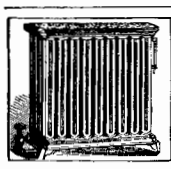

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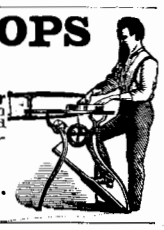

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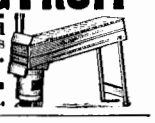

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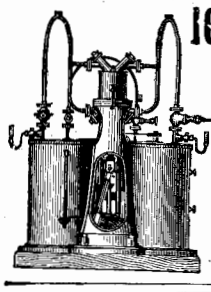

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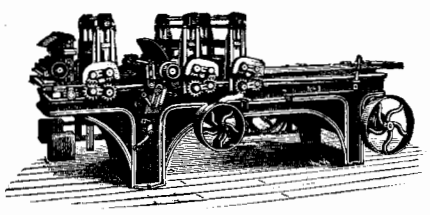

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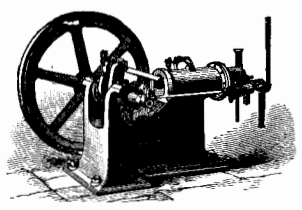

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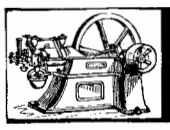

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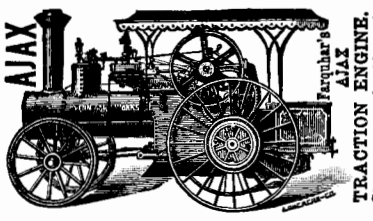
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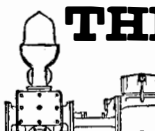

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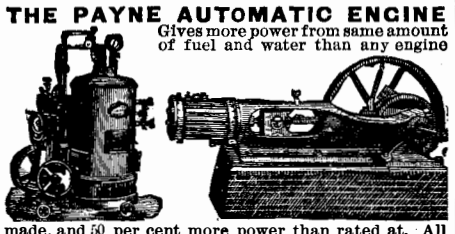

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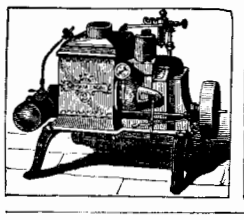

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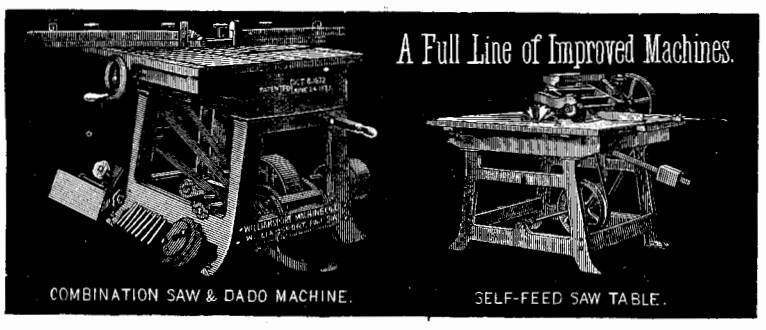


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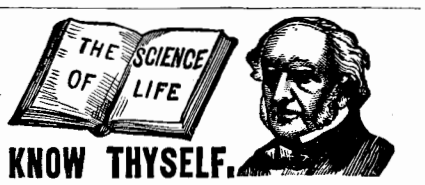


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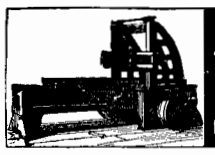

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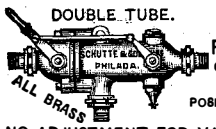


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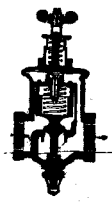

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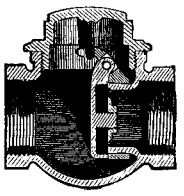

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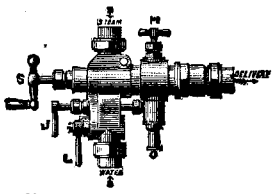

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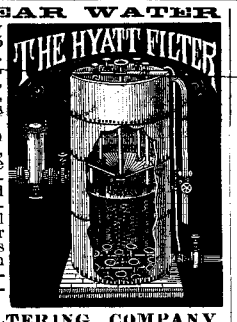


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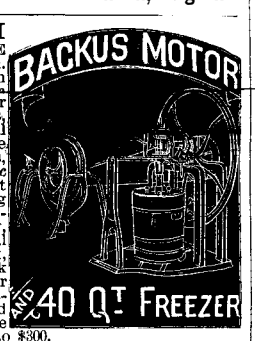


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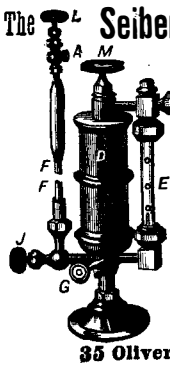


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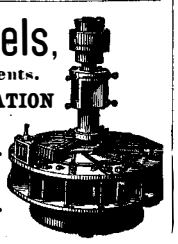

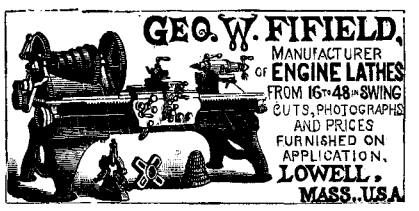
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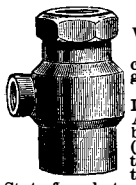

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